The NATIONAL GEOGRAPHIC MAGAZINE

Vol. XVI NOVEMBER, 1905 No. 11

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Published by the National Geographic Society
Hubbard Memorial Hall
Washington, D. C.

$2.50 a Year REPRINT 25 Cents a Number

Entered at the Post-Office in Washington, D. C., as Second-Class Mail Matter

THE NATIONAL GEOGRAPHIC MAGAZINE

AN ILLUSTRATED MONTHLY, published by the NATIONAL GEOGRAPHIC SOCIETY. All editorial communications should be addressed to the Editor of the NATIONAL GEOGRAPHIC MAGAZINE. Business communications should be addressed to the National Geographic Society.

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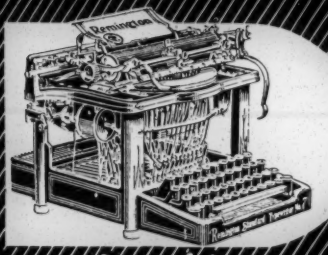

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VOL. XVI, No. 11 WASHINGTON NOVEMBER, 1905

THE NATIONAL GEOGRAPHIC MAGAZINE

GEOGRAPHY*

BY REAR-ADMIRAL SIR W. J. L. WHARTON, K.C.B., F.R.S.

IT is sometimes denied to geography that she has any right to consider herself as a science, the objection being apparently founded on the view that it is a subject that can be learned by heart, but not studied on any systematic line or reduced to principles which enable advance to be made, as in the more exact sciences, by continual investigation by means of laws discovered in the course of such investigation. This, it appears to me, is a misapprehension due to an incomplete recognition of what science is and of what geography is.

Science is, in the simplest interpretation, "knowledge," such knowledge as comes from an intimate acquaintance with and study of any subject duly coördinated and arranged. The subjects which the advancing education and civilization of the world have caused to be minutely studied are very many, and as knowledge has increased specialization has become a necessity, until the list of sciences is very long.

Science may be broadly divided into several categories: pure or exact science, such as mathematics; natural or physical science, which rests on observations of nature; moral science, which treats of all mental phenomena.

Some sciences are of ancient foundation, some have arisen from new inquiries and needs of man or from fissure in subjects too wide for convenient treatment as one. Many of them are capable of exact definition, and their boundaries and limits can be well marked. To others no very distinct limitations can be assigned. From their nature they overlap and are overlapped by other subjects, and it is impracticable to confine them by a strict line. Geography is one of the latter.

Geography is one of the most ancient subjects studied with the view of coördinating facts. A desire for exact knowledge of, first, the bearings and distances of one place from another for the purposes of intercommunication must have arisen as soon as men became collected into groups whose growing civilization and needs required travel to obtain what could not be obtained in the community.

* An address to the British Association for the Advancement of Science, Johannesburg, South Africa, August 30, 1905. Sir William Wharton was unfortunately taken sick only a few days after the address was delivered and died at Capetown, September 29, from enteric fever and pneumonia. He was 62 years of age, and for a number of years had been Hydrographer of the Admiralty.

This was the earliest form of geography, and it is an aspect which still remains, and to some is, in the modern shape of maps, the principal, if not the sole, end of geography.

From the earliest times, however, geographical information included other than topographical data. It was soon found that for the traveler and statesman, whether in peace or war, more was wanted to enable geography to supply requirements. The nature of a country, the supply of food and water, the character of the rivers, the manners and customs of the inhabitants, their language and affinities, the climate, and other matters, were all of much moment, and geography dealt with them all, being, as its name denotes, in the broadest sense a "description of the earth."

After the first crude guesses of relative positions, founded on times occupied on journeys, other knowledge was enlisted in the cause.

Astronomy was soon recognized as the only means by which to ascertain the distances of places far apart and separated by seas, but for many centuries this could only be applied to latitude. Still the scientific geographer had to study and use the astronomical and geodetic methods known.

GEOGRAPHY IS THE PARENT OF MANY SCIENCES

As knowledge increased, the subjects became too wide to be strictly considered as one study, and many have become the objects of special research under different titles.

Geodesy deals with the precise form of the earth and its dimensions.

Geology studies the nature of the materials forming the earth's crust and the changes in it in past ages.

Ethnology and *Anthropology* treat of the different races of mankind.

The study of *Economics* takes note of the conditions of communities and nations, their laws and systems of government.

Botany and *Zoölogy* now concern themselves with the details of vegetable and animal life.

Archæology investigates the remains of past civilizations which cover the earth.

Meteorology strives to unravel and reduce to law the complicated conditions of the atmosphere, its continual movements, and the results which have such varying effect on our daily life.

Oceanography, the study of the phenomena of the sea as distinct from the dry land, is still regarded as an integral part of geography, but is rapidly becoming a subject by itself.

Of all these subjects geography may be considered to be the parent; and though the family be large and has gone off on many separate lines, it is necessary when taking a large and comprehensive view of the united results of knowledge thus gained, especially from the point of view of distribution, to return to that parent and consider them on a general or geographical basis.

I cannot pretend to define geographical science in a clearer or shorter form than that in which it has been already put by General Sir Richard Strachey, and I will quote his words:

"To investigate and delineate the various features of the earth, to study the distribution of land and sea, and their effects upon climate, the configuration and relief of the surface, positions on the globe, and so forth, facts which determine the existent conditions of various parts of the earth, or which indicate former conditions, and to ascertain the relations that exist between those features and all that is observed on the earth."

Strabo, in the opening words of his introduction to his great geography, puts it thus:

"If the scientific investigation of any subject be the proper avocation of the philosopher, geography, the science of which we propose to treat, is certainly entitled to a high place. In addition

to its vast importance in regard to social life and the art of government, geography unfolds to us the celestial phenomena, acquaints us with the occupants of the land and ocean, and the vegetation, fruits, and peculiarities of the various quarters of the earth."

This was written when geography included all natural science, and before it gave birth to so many separate subjects; but it sets forth so admirably the aims which the geographer still pursues that it is worthy of remembrance.

GEOGRAPHICAL KNOWLEDGE ESSENTIAL TO THE MAN OF AFFAIRS

It is not advocated, nor is it in any way necessary, that all should study geography in the extended sense thus indicated; but it cannot be too strongly pointed out that an educated man—and education is now essential to the successful conduct of affairs—must have a considerable knowledge of the elementary facts of geography.

These elementary facts are, it is true, of the nature of a lesson, and must be learned, so to speak, by heart by the aid of maps and books; but this is nothing more than making use of the labors of others, without which no advance is possible in any subject, and is common to all studies.

We must, in fact, distinguish between the science of geography, which consists in ascertaining and coördinating new facts and putting them into a shape for the use of others, which is the work of comparatively few; and the practical geography which consists of making use of that work, and, as in many other branches of science, is within the reach of all who choose to devote time to it.

It is impossible to have a clear comprehension of history, whether past or current, without calling in the aid of geography; but unfortunately much history has been written and taught without such aid.

To read the daily papers requires either geographical knowledge or constant reference to maps, and if readers would only make a practice of such reference on every occasion when they are at fault, they would soon find themselves acquiring knowledge of the greatest use to them in the easiest and most interesting manner and with the smallest expenditure of time.

The mistakes made even by those responsible for the conduct of public affairs, by reason of the want of this essential but elementary knowledge, are innumerable, and to this day there are many who consider themselves highly educated and capable men who cannot even rightly understand a map.

GOOD MAPS THE FOUNDATION OF GEOGRAPHICAL KNOWLEDGE

As I have before indicated, good maps are the foundation of all sound geographical knowledge, and these maps must be founded on good surveys.

Now a good survey is a comparatively modern operation, and the parts of the world that have been subjected to it are small indeed.

It is true that we now have general maps of the larger parts of the world, which more or less convey a fair representation of the configuration of land and sea when large areas are considered, but details are sadly lacking almost everywhere.

To many people one map is as good as another. They do not pause to consider on what it is based or what degree of accuracy it probably possesses, but so long as there is a map they are satisfied.

A vast number of existing maps are compiled from the roughest materials; in partly occupied countries, from drawings of small areas placed together as can best be done, by means of places here and there, the relative positions of which are fairly known by distances along roads, with perhaps in some cases angles and astronomical positions; in less civilized parts by routes of travelers

laid down by estimation of the distance traversed and direction of march, checked perhaps by a few astronomical observations of more or less value as the traveler possesses or does not possess the necessary skill.

The compilers of such a map have a difficult task. Discrepancies are, of course, multitudinous. Nothing agrees, and one has to accept, reject, and adjust as best he can on his own responsibility and with what knowledge he can procure of the respective trustworthiness of each author.

Happy is he if he has even a few positions on his map which have been properly determined, as between them he is saved from the constantly increasing errors of adding one little area to another, which if carried on indefinitely culminates in great errors.

Of course such maps are of no practical use, save as giving a very general idea of a country, and when required by the administrator or traveler lead to endless mistakes and annoyances.

THE COAST LINE OF THE WORLD PRACTICALLY DETERMINED

The feature of our globe which is now, broadly speaking, most accurately laid down is the coast line. The safety of navigation has caused general marine surveys to be carried on all over the world during the nineteenth century, which have finally determined the position and shape of the boundaries of the sea.

These surveys, executed for the most part by skilled naval officers with proper instrumental outfit, and supplied especially with trustworthy chronometers, and based upon frequent carefully determined astronomical positions, have resulted in this boundary line being delineated with an accuracy, so far as its absolute position is concerned, far in advance of any other main feature in maps. Here I may perhaps explain to those unversed in these matters why this is so.

The position of any spot on the earth's surface can be ascertained in two ways: either by careful measurement by means of an accurate system of triangles from another spot already fixed, or by independent observations of the heavenly bodies and calculations from them, which give the precise latitude and longitude of the place. The former is suitable for positions inland, but entails much time and labor, and is only adopted when a perfect map is to be made, for which it is the indispensable foundation. The latter can be carried on from a ship, and in most circumstances only from a ship, because of the limitations of the methods of determining longitudes.

Longitude can now be satisfactorily and rapidly ascertained in two ways—by the electric telegraph or by use of chronometers.

The places served by the electric telegraph are still few, and its use is therefore restricted; but the chronometer has been in working use for more than a hundred years.

This instrument, which is merely a watch of especial construction, will only keep a steady rate when it is undisturbed by irregular shocks or motions.

No means have yet been found for transporting a chronometer on land without upsetting its regularity, and therefore rendering it useless; but on board a ship it can be so suspended and stowed as to prevent its being disturbed by any ordinary movements of or in the ship. The accurate time of any place departed from, ascertained by astronomical observations, can therefore be carried about on board ship for considerable periods, and by comparison with the local time, also determined by sextant observations of the heavenly bodies, at any required spot on the coast, the difference of longitude is at once obtained with very small limits of error when a number of chronometers are employed. These two simple yet marvelous instruments—the sextant and

the chronometer—have thus placed in the hands of sailors ready means of fixing with great exactitude and celerity the position of selected points on coasts all over the world; and it will be seen that, while the detail of the line of coast between such fixed positions will depend upon the degree of accuracy of the survey or sketch, the general line cannot get far out, as it is constantly checked at the selected points.

It is not claiming too much to say that at the present time very few salient points on the coast lines of the world are as much as two miles in doubt.

It should be a source of great satisfaction to the Briton to know that both of these instruments were devised by Englishmen, John Hadley producing the sextant in 1730, in the form still used, on the basis of ideas formulated by Newton fifty years before, and John Harrision the chronometer in 1736. The latter instrument has undergone modifications in detail, but the principle remains the same. It required seventy years before its value was fully recognized and it came into general use.

MARINE SURVEYS BY BRITISH NAVAL OFFICERS

It is a still further satisfaction to think that it is British naval officers who have made by far the greatest use of them in mapping the coasts of the whole world. Since the time of the great Captain Cook, British surveying vessels have been constantly employed in this work, not only in British colonies, but in all parts, aiding and often paving the way for British commerce and for the men-of-war that protect it.

It is difficult to find coasts of any extent that have not been laid down by British marine surveyors. The whole of Africa has been their work. By far the greater part of America, all the south and east coasts of Asia, Australia, and most of the innumerable islands in all oceans have been fixed and laid down by them. Even in the Mediterranean, until very lately, the charts were mostly founded on British surveys, and the improvements now being carried out by other nations on their own coasts in details required for modern navigation do not materially modify the main shapes and positions formerly determined by the British.

It has been, and is, a great work, and I hope I may be pardoned for dwelling on it with pride as the result of the wise administration of the admiralty for many years, and of the immediate labors of my predecessors as hydrographer, and as a very great contribution to geographical knowledge, more especially as I do not think that it is generally realized that this great advance in geographic accuracy is due to marine surveyors.

To give an idea of the comparative accuracy of the chronometer method, I may mention that on taking at hazard eleven places distributed all over the world at great distances from England, the longitudes of which have been recently determined by means of the electric telegraph and elaborate series of observations, I find that the average difference between the chronometer and the telegraph positions is 700 yards. The shapes of the different continents and the positions of islands as at present on our maps and charts will never be altered except in insignificant degree, and the framework is ready for many years' work of land mapping.

THE PERILS OF THE DEEP

It is not to be inferred from what I say that marine surveys are approaching their close. It is far otherwise. The time given to these enormous extents of coasts and seas and the necessarily small scales on which the surveys have been carried on have caused them to be very imperfect in all details. Hundreds of rocks and shoals, both stretching from the land and isolated in the sea, have

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been missed in the course of them, and loss of ships and life on these unknown dangers still continues. With the increase of shipping, increased number of ships of heavy draft, the closeness of navigation due to steam, and the desire to make quick passages, smaller inaccuracies of the charts become yearly of greater importance.

As an illustration of the condition of affairs, I may mention that in Hamoaze, the inner harbor of Plymouth, one of the headquarters of the British fleet for more than 300 years, a small but dangerous pinnacle of rock was only discovered five years ago, while numerous other dangers of a similar character have been yearly revealed in close surveys of other harbors in the United Kingdom supposed to be well examined and charted in the last century.

There never was a greater need for close marine surveys of places frequented by ships than now.

THE EARLIEST MAPS

It is interesting to look back and see the gradual progress of the delineation of the world and to mark how very recent any approach to accuracy is.

The very earliest maps of any extent of country are unfortunately lost to us. The first man who made a map of which any historical record exists is Anaximander of Miletus, about 600 B. C., but we know nothing of it. A map is mentioned by Herodotus as having been taken in 500 B. C. by Aristagoras of Miletus in the shape of an engraved bronze plate whereon the whole circuit of the earth was engraved, with all its seas and rivers, to influence Cleomenes, King of Sparta, to aid the Ionians against Persia. This was probably the work of Hecatæus, to whom early geography owed much. His works are also only known to us by quotation; but they are especially interesting as containing an early idea of the limits of Africa, which he represents as entirely surrounded by the sea—a circumstance apparently either forgotten or disbelieved in later years.

Erotosthenes, 250 B. C., and Hipparchus, 150 B. C., made great advances, and the former made the first attempt to measure the size of the earth by the difference of latitudes between Assouan and Alexandria in Egypt, an attempt which, considering the great imperfection of his means, was remarkably successful, as, assuming that we are right in the length of the stadium he used, he made the circumference of the globe 25,000 geographical miles, whereas it should be 21,600.

He also devised the system of meridians and parallels as we now have them; but the terms "latitude" and "longitude," to denote positions on those circles, were introduced by Ptolemy.

The maps of Ptolemy, the great Alexandrian astronomer and geographer of A. D. 150, are the earliest we possess. He drew, besides a general map of the whole known world from the southern part of the Baltic to the Gulf of Guinea, north and south, and from the Canary Islands to the China Sea, east and west, a series of twenty-six maps of the different parts.

Ptolemy's maps and his method of representing the spherical globe on a flat surface had a great influence on geography for many years. After his time the Greek civilization waned, and the general decline of the Roman Empire, followed by its disruption by the invasion of barbarians, closed the course of discovery in all branches of research for centuries. It is not too much to say that for 1300 years no advance was made, and until the commencement of exploration by sea, which accompanied the general revival of learning in the fifteenth century, Ptolemy's maps represented the knowledge of the world

As might be expected, the further he got from the Mediterranean, the greater were his errors; and his representations

of eastern Asia and northwestern Europe are somewhat grotesque, though quite recognizable in the main.

Of Africa south of the equator he knows nothing, and his map of it terminates with the border.

AFRICA PROBABLY CIRCUMNAVIGATED 600 B. C.

This is somewhat remarkable, as I am one of those who firmly believe in the circumnavigation of Africa by the Phœnicians sent by Necho, King of Egypt, in 600 B. C. from the head of the Red Sea. As described by Herodotus, the voyage has all the impress of veracity. My personal faith in Herodotus was much strengthened by finding when I surveyed the Dardanelles in 1872 that his dimensions of that strait were nearer the truth than those of other and later authorities, even down to the time at which I was at work, as well as by other geographical tests I was able to apply. When, therefore, he records that the Phœnicians declared that in their voyage they had the sun on their right hand, and says he does not believe it, he registers an item of information which goes far to prove the story correct. Influenced by Hecatæus, who though surrounding Africa by the sea cut it far short of the equator, Herodotus could not conceive that the travelers had passed to the south of the sun when it was in the southern tropic.

No historical incident has been more discussed than this voyage, commentators varying much in their opinions of its truth. But we have today some new facts. No one who has followed the exploration of the ancient buildings in Rhodesia, and considered the information we possess on the early inhabitants of southern Arabia, whether we call them Sabæans or Himyarites, can doubt that the former were mainly the work of men coming from Arabia at a very early date, while the period of time necessary to carry out gold-mining operations over the large areas now found to have been exploited must have been very great.

It seems strange that no record of the constant voyages to this El Dorado should remain, but the very natural desire to keep lucrative information to themselves is not an unknown thing among traders of the present day, while the conditions of society and the absence of written records of south Arabia would make concealment easy.

The Phœnicians, an allied race and the great seafaring trading nation of the Mediterranean, succeeded in keeping the majority of their marts secret, and we have incidents recorded showing their determination not to allow others to follow their steps, while to this day we are very doubtful of the limits of their voyages.

It may be considered certain that while we naturally quote Greek historians and geographers as the early authorities for the growth of geographical knowledge, and that the scientific basis for proper maps of large areas was really provided by them, the seafaring nations—Arabians, Phœnicians, and Chinese—knew a very great deal practically of the coasts of various parts of the Old World that were absolutely unknown to the Greeks.

THE PERIODIC WINDS ALONG THE COAST FAVORABLE

The favorable conditions afforded by those remarkable periodic winds, the monsoons, would in the China Sea, Bay of Bengal, and the Arabian Sea naturally facilitate any attempts at extensive sea voyages, and would lead to such attempts under conditions that in the regions of variable winds would be considered too dangerous and uncertain. The fact that the monsoons in nearly every case blow practically parallel to the coasts in opposite directions is a most important factor in considering early navigation. The direction of the

wind itself in such cases roughly guides a vessel without a compass, and the periods of cyclones and unsettled weather between the monsoons would soon be noted and avoided, as they are to this day by the Arabs and Chinese, whose vessels, I have very little doubt, have remained practically the same for thousands of years.

The unknown Greek author of that unique and most interesting document, the "Periplus of the Erythræan Sea," probably of the first century A. D., describes vessels built without nails, the planks of which were bound together by cords, in precisely the same way as many Arab dhows now navigating the Indian Ocean. His personal knowledge of Africa evidently ceased at Cape Guardafui, though he gives information gained from others on the east coast as far as Zanzibar, which—or rather a part on the mainland near—he describes as the limit of trade to the south. We know that Arabs had penetrated further, but no doubt they kept their knowledge to themselves.

EARLY NAVIGATORS HAD CHARTS WHICH HAVE BEEN LOST

These early navigators very probably had charts. When Vasco da Gama first passed along the eastern coast of Africa he found that the Arab dhows had charts. Unfortunately none of them has come down to us, or it would have been interesting to compare them with those of the west coast used by the Portuguese at the time, and which were of the crudest description.

I claim for sailors of all ages that they would be the first to make practical maps of the shape of the coasts. Their safety and convenience demanded it, while it is a far easier task to compile such a picture of the earth from successive voyages along coasts over the sea, where average distances from known rates of sailing and courses from the sun and stars can be more accurately ascertained, than from long and generally tortuous land journeys in directions governed by natural features, towns, and so forth. A navigator *must* be a bit of an astronomer. A landsman to this day seldom knows one star from another.

It was the sea charts, or *portolani*, of the Middle Ages that on the revival of learning first gave respectable representations of the shape of the coasts, at a time when the learned monks and others were drawing the most fantastic and absurd pictures, which they called maps.

At the same time, it must be remembered that in all ages and down to the present day pilots who, within a hundred years were usually carried by all ships, even for sea voyages, jealously keep their knowledge largely in their heads, and look upon good charts as contrivances to destroy their profession, and that such charts or notes as they had they would keep religiously to their fraternity.

The Egyptians were no sailors, but we know that they habitually employed Phœnicians for sea expeditions, while we have the historical record of the Old Testament for their employment by David and Solomon for a like purpose in the Red Sea, and probably far to the south. It is therefore almost impossible to doubt that the Phœnicians were also acquainted with the navigation of the Red Sea and east coast of Africa. Such a voyage as that recorded by Herodotus would in these circumstances be far from improbable.

The varying monsoons which had led the Arabians centuries before to get so intimate a knowledge of the east coast as to enable them to find and work the gold fields would be well known to the Phœnicians and the hardy seamen who braved the tempestuous regions lying between Cadiz and Great Britain would make little of the difficulties of the African seas.

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The limit of easy navigation from and to the Red Sea is Sofala. I do not think that it is too great a use of imagination to suppose that it would be from information received in what is now north Rhodesia that it was learnt that to the westward lay the sea again, and that this led to the attempt to reach it by the south.

Once started from the neighborhood of Sofala, they would find themselves in that great oceanic stream, the Agulhas Current, which would carry them rapidly to the southern extremity of Africa.

I, as a sailor, can also even conceive that finding themselves in that strong current they would be alarmed and attempt to turn back, and that after struggling in vain against it they would have accepted the inevitable and gone with it, and that without the Agulhas Current no such complete voyage of circumnavigation would have been made.

As Major Rennell in the last century pointed out, once past the Cape of Good Hope, the periodic winds and, over a great part of their journey, the currents would help them up the West African coast, and the general conditions of navigation are favorable the whole way to the Straits of Gibraltar, the ships keeping, as they would do, near the land; but we can well understand that, as recorded, the voyage occupied nearly three years, and that they halted from time to time to sow and reap crops. I should say that it is highly probable that either Simon's Bay or Table Bay was selected as one of these stopping places.

THE WELL-KNOWN SECRECY OF THE PHŒNICIAN VOYAGERS

No reference to this voyage has been found among the hieroglyphic records, and, indeed, so far few such records of Necho, whose reign was not for long, are known, but that it was regarded at the time as historical is evident, for Xerxes, a hundred years later, sent an expedition to repeat it in the contrary direction.

This, however, failed, and the unfortunate leader, Sataspes, was impaled on his unsuccessful return.

This attempt shows that the greater difficulty of the circumnavigation from west to east, as compared with that from east to west, was not realized, and points to the concealment of any details of the successful voyage.

Of Hanno's voyage from the Straits of Gibraltar to about Sierra Leone, the date of which is uncertain, but from 500 to 600 B. C., we should know little had not good fortune preserved the record deposited in a Carthaginian temple.

But the well-known secrecy of the Phœnicians in all matters connected with their foreign trade and voyages would explain why so little was known of Necho's voyage, and our present knowledge of the extensive ancient gold workings of Rhodesia shows how much went on in those times of which we are wholly ignorant.

I have dwelt perhaps too long on this subject, but it has to me a great interest, and as it has not, so far as I know, been dealt with by a seaman who is personally well acquainted with the ways of seamen in sailing ships and with the navigation of the coasts in question, I hope I may be excused for putting my views on record.

There are several references in Greek and Latin historians to other circumnavigations, but none of them can be trusted, and apart from Necho's voyage we hear nothing of the east and south coasts of Africa until the arrival of the Portuguese at the end of the fifteenth century. But they found a thriving civilization along the coast from Sofala northward—Shirazi, Arab, and Indian.

Ruins exist in many places which have not yet been properly investigated, and we are quite unable to say from what date we are to place the earliest foreign settlements, nor how many

breaks existed in the continuity of the gold mining, which apparently was proceeding at or very shortly before the Portuguese visit.

After the recommencement of exploration by sea in the fifteenth century, seamen slowly gathered enough information to draw the lines of the coasts they passed along, and in time—that is, by the middle of the eighteenth century—most lands were shown with approximately their right shapes. But of true accuracy there was none, for the reason I have before mentioned, that there was no exact method of obtaining longitude.

If we look at a general world chart of A. D. 1755—and to get the best of that period we must consult a French chart—we shall find on this small scale that the shape of the continents is fairly representative of the truth. But when we examine details we soon see how crude it all is.

THE BEST CHARTS OF 1755, ON AN AVERAGE, FORTY-EIGHT MILES IN ERROR

I have compared with their true positions the positions of thirty-one of what may be taken as the fundamental points in the world as given in the larger scaled French charts of 1755, from which the general one is drawn, and I find that on an average they are forty-eight miles in error. The errors vary from 160 miles to 2 miles. If the delineation of the coast lines between be considered, the inaccuracies are very much greater.

Very shortly after this date more accurate determinations began to be made. The method of lunar distances was perfected and facilitated by tables published in the various astronomical "ephemerides," and seamen and explorers commenced to make use of it. Still the observation required constant practice, and the calculation, unless constantly made, was laborious, and it was used with complete success by the few. The great Captain Cook, who may be looked upon as the father of modern methods of surveying, did much to show the value of this method; but the chronometer came into use shortly after, and the principal advance in exact mapping was made by its aid, as I have already stated.

There is a vast amount yet to be done for geography. Until we possess publications to which we can turn for full information on all geographical aspects of things on this globe of ours, there is work to be done. Seeing that our present publications are only now beginning to be worthy of being considered trustworthy for the very small amount of knowledge that we already possess, geographical work in all its branches is practically never-ending.

VERY LITTLE OF EXPLORATION REMAINS TO BE DONE

But of exploration pure and simple very little remains to be done. The charm of traveling through and describing an entirely new country which may be practically serviceable to civilized man has been taken from us by our predecessors, though limited regions still remain in Central Asia and South America of which we know little in detail.

I must except the Polar regions, which are in a somewhat special category, as their opening up affords few attractions to many people. But a knowledge of the past history of our globe—fit study for human thought—can only be gained by study of the portions still under glacial conditions.

What is there round the South Pole—a continent or a group of large islands? What is going on there? What thickness does ice attain? Have these regions always been glaciated, and if not, why not? Can we get any nearer the mystery of magnetism and its constant changes by study at or near the magnetic poles? All these and many other scientific questions can only be solved by general geographical research in

these regions, and all interested in such questions have been delighted at the recent attempts to gain more knowledge.

The object of these expeditions was frankly and purely scientific. All hope of remunerative whale or seal fisheries had been dispelled by the visit of the Norwegian whalers in 1892 to the region south of Cape Horn, and the known general condition of the land forbade any expectation of other profitable industries, unless, indeed, gold and other valuable minerals should be found, which is always possible. Beyond the fact that exploring expeditions of this character keep alive the spirit of enterprise and bring out the finest characteristics of a race—which is a point by no means to be despised—no immediate practical benefit was to be expected.

Progress under the conditions must be slow, but I think that Great Britain may well be satisfied with the information collected in the Antarctic by Capt. R. F. Scott and his gallant companions The unfortunate detention of the *Discovery* by an unfavorable summer prevented the further coastal exploration which was part of the programme, but gave opportunity for further detailed examination of the inland conditions, which was carried out in defiance of the severest atmospheric and topographical difficulties, and with the greatest zeal and intelligence; and it may be doubted whether science in the end has not gained more than she lost by the unexpected diversion of energy. The healthy conditions which prevailed throughout are a standing proof both of Captain Scott's eminent capacity as a leader and of the cheery spirit which animated the whole expedition. The full results of the scientific observations are not yet worked out, and in many cases for a complete appreciation of their bearing they must be compared and correlated with those of the other Antarctic expeditions, but many highly suggestive points have already been revealed.

For the first time Antarctic continental land has been traveled over for long distances, and though the actual area of new discovery looks small on a map of the world, the distances covered can only be described as extraordinary, and far exceeding the most sanguine anticipations. Few who considered the mountainous coast line of Victoria Land and its complete glaciation, as reported by Sir James Ross from his distant view, thought that it would prove practicable not only to ascend those mountains, but to reach to heights much surpassing them behind.

The reason that it proved feasible is that, while there are occasional heavy snowstorms, the annual snowfall is small, and the surface, therefore, is generally unencumbered with soft deep snow.

And what did Captain Scott find after his memorable struggle up the glacier through the mountains?

An enormous plateau at an elevation of about 9,000 feet, nearly level, smooth, and featureless, over which he traveled directly inland for more than 200 miles, seeing no sign at his farthest point of any termination or alteration in character. So far as could be seen from other journeys, glacial discharge from this great ice-sheet is very small, and practically it appears to be dead. Its accretion by fresh snowfall is insignificant, while on all sides along the flanks of the coastal mountains there are signs of diminution in the mass of ice.

THE GREAT ICE MASS IN THE ANTARCTICS IS APPARENTLY DISAPPEARING

The great ice-barrier east of Ross Island tells the same tale. This magnificent feature presents to the sea a face of perpendicular ice cliffs varying from 60 to 240 feet in height and 450 sea miles long. Sir J. Ross mapped its position in 1841, and Captain Scott finds that it has retreated on an average 15 miles, varying much in different parts.

Should this rate of retreat continue, the whole of this ice mass, so far as Captain Scott saw it, will have vanished in 1,000 years.

As the motion of the ice mass is also about 15 miles to the north in the same time, icebergs covering collectively an area of 450 miles by 30 have been discharged from it in 60 years.

Captain Scott traveled over it nearly due south to a point 300 miles from its face, and then saw no sign of its end.

It is bordered on its western side by a mountainous coast line, rising in places to 15,000 feet. He found the ice practically flat and wholly unfissured, except at the side, where its northerly motion, found to be about 130 feet in the month, caused shearing and vast crevasses. All that is known of its eastern edge is that it is bordered, where it meets the sea, by land from 2,000 to 3,000 feet high, suspected by Ross and verified by Captain Scott. This may be an island, or more probably the eastern side of the great fiord or bay now filled by the barrier.

Captain Scott is of opinion that this great ice-sheet is afloat throughout, and I entirely agree with this conclusion. It is unexpected, but everything points to it. From soundings obtained along the face, it undoubtedly has about 600 feet of water under it.

It is difficult to believe that this enormous weight of ice, 450 miles by at least 360, and perhaps very much more, with no fall to help it along by gravity, can have behind it a sufficient force in true land glacier to overcome the stupendous friction and put it in motion if it be resting on the bottom. It is sufficiently astonishing that there is force enough even to overcome the cohesion at the side, which must be very great.

The flat nature of the bottom of the Ross Sea and the analogies of many geographical details in other parts of the world make it most probable that the water under the whole barrier is deep.

A point on which I have seen no comment is the difference in the appearance of the slopes of Mount Terror. Captain Scott found the bare land showing over large areas, but during the two summers of Ross's visit it was wholly snow-clad. Sir Joseph Hooker, the sole survivor of Ross's expedition, when questioned had no doubt on the subject and produced many sketches in support.

This may be due to temporary causes, but all the information collected by the expedition points without doubt to steadily diminishing glaciation in recent times. We have, therefore, this interesting fact, that both in Arctic and Antarctic regions, as indeed all over the world, ice conditions are simultaneously ameliorating, and theories of alternate northern and southern maximum glaciations seem so far disproved.

But this does not mean that climatic conditions in the Antarctic are now less severe—probably the contrary. It has been pointed out by many that land glaciation may arise from varied primary causes, but one obvious necessity is that the snowfall should exceed melting and evaporation. It need not be heavy, but if it is it may produce glaciation under somewhat unexpected conditions. This would entail a vapor-laden air more or less continuously impinging upon the land at a temperature which will enable it when cooled, either by passing over chilled land or when raised to higher regions by the interposition of mountains, to give up its moisture freely. This condition is not fulfilled when the air as it arrives from the sea is already at a very low temperature.

It was my fortune to spend two long seasons in the Straits of Magellan, and I was daily more impressed by what I saw.

There you have a mountainous ridge of no great height—very few peaks rising more than 4,000 feet—opposed to the almost continuous westerly winds pouring in from the Pacific at a very

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moderate temperature and charged with much moisture.

The result is that in the latitude of Yorkshire every mountain mass over 3,000 feet high is covered with eternal snow and sends glaciers down to the sea.

I was convinced by what was going on under my eyes that it only required an upheaval of the land of 2,000 feet or so to cover the whole of Patagonia with ice. But then the climate would still not be very severe. The temperature of the wind from the sea would be the same, and such part of it as blew along the channels and on the lower land would moderate the cold caused by the ice-covered slopes.

The shores of the whole of western southern Patagonia, deeply indented with long and deep fiords, indicate, according to all received views of the origin of such formations, that the land was formerly higher, while signs of glaciation are everywhere present.

CHANGES OF CLIMATE

The results of geographical research show us that in many parts of the world climate must have greatly changed in comparatively recent times.

In the now arid regions of northern Africa, central North America, and in parts of Asia, there is ample evidence that the climate was in times past more humid. In a remarkable paper on the causes of changes of climate, contributed by Mr F. W. Harmer to the Geological Society in 1901, and which has not obtained the notice it deserves, it is pointed out how changes in the distribution of the prevalent winds would vastly alter climatic conditions. Like everything else in nature, and especially in the department of meteorology, these questions are exceedingly complex, and similar results may be brought about in different ways; but there can be no doubt that the climate of South Africa would be greatly modified, and more rainfall would occur, if only the cyclonic storms which now chase each other to the eastward in the ocean south of the Cape of Good Hope could be prevailed upon to pursue a slightly more northerly line, and many obstacles to the agricultural prospects of South Africa now existing would be removed. This is, however, beyond the powers of man to effect; but, as I have just said, there are other ways of attaining the object, and it is earnestly to be hoped that the attention now being paid to afforestation may result in vigorous efforts to bring about by this means the improvement in humidity so much required in many parts of the country.

NEW KNOWLEDGE OF TIBET

The other recent event in geographical exploration is the result of the expedition to Lhasa. It was an unexpected solution of this long-desired knowledge that it should come from political necessities and by means of a government mission. The many ardent travelers who have dreamed of one day making their way in by stealth have thus been disappointed, but our knowledge is now fuller than could otherwise have been gathered.

The most important fact is the revelation of the fertility of a large part of southern Tibet. Much has been added to topographical knowledge, but the route maps of the secret Indian native surveyors already had given us a rough knowledge of the country on the road to Lhasa. It was not, however, realized how great was the difference between the aridity of the vast regions of the north, known to us from the travels of men of various nationalities, and the better-watered area in the south, though from the great height of the plateau—some 12,000 feet—the climate is very severe. The upper course of the Brahmaputra has been traced by Captain Ryder, but unfortunately a political veto was placed on the project to solve the interesting problem of how this great

river finds its way to the Indian plains, and this still remains for the future to unravel.

RECENT STUDY OF THE OCEANS HAS BROUGHT MUCH TO LIGHT

It is of the ocean, more than of any other physical feature of our globe, that our knowledge has increased of late years. Forty years ago we were profoundly ignorant even of its depth, with the exception of a few lines of soundings then recently taken for the first submarine telegraph cables, and consequently we knew nothing of its real vast bulk. As to the life in it and the laws which govern the distribution of such life, we were similarly ignorant, as of many other details.

The *Challenger* expedition changed all this, and gave an impetus to oceanographic research which has in the hands of all nations borne much fruit.

Soundings have been obtained over all parts of the seas, even in the two Polar seas; and, though much remains to be done, we can now form a very close approximation to the amount of water on our earth, while the term "unfathomable ocean" has been shown to have been based on an entire misconception. Biological research has also revealed a whole world of living forms at all depths, of the existence of which nothing was known before.

In my former address, eleven years ago, I gave many details about the sea, of which I will only repeat one—which is a fact that every one should know—and that is that the bulk of the ocean is about fourteen times as great as that of the dry land above water, and that if the whole of that land were thrown into the Atlantic Ocean it would only fill one-third of it.

Eleven years ago the greatest depth known was 4,700 fathoms, or 28,000 feet. We have since found several places in the Pacific where the depth is nearly 5,170 fathoms, or 31,000 feet, or somewhat higher than Mount Everest, which has been lately definitely shown to be the culminating point of the Himalayas. These very deep parts of the ocean are invariably near land, are apparently in the shape of troughs, and are probably due to the original crumpling of the earth's surface under slow contraction.

THE EFFECT OF THE SEA UPON CLIMATE

The enormous area of the sea has a great effect upon climate, but not so much in the direct way formerly believed. While a mass of warm or cold water off a coast must to some extent modify temperature, a greater direct cause is the winds, which, however, are in many parts the effect of the distribution of warm and cold water in the ocean perhaps thousands of miles away. Take the United Kingdom, notoriously warm and damp for its position in latitude. This is due mainly to the prevalence of westerly winds. These winds, again, are part of cyclonic systems principally engendered off the coasts of eastern North America and Newfoundland, where hot and cold sea currents, impinging on one another, give rise to great variations of temperature and movements of the atmosphere which start cyclonic systems traveling eastward.

The center of the majority of these systems passes north of Great Britain. Hence the warm and damp parts of them strike the country with westerly winds which have also pushed the warm water left by the dying-out current of the Gulf Stream off Newfoundland across the Atlantic, and raises the temperature of the sea off Britain.

When the cyclonic systems pass south of England, as they occasionally do, cold northeast and north winds are the result, chilling the country despite the warm water surrounding the islands.

It only requires a rearrangement of the direction of the main Atlantic cur-

rents wholly to change the climate of western Europe. Such an arrangement would be effected by the submergence of the Isthmus of Panama and adjacent country, allowing the equatorial current to pass into the Pacific. The gale factory of the western Atlantic would then be greatly reduced.

The area south of the Cape of Good Hope is another birthplace of great cyclonic systems, the warm Agulhas Current meeting colder water moving up from the Polar regions; but in the Southern Ocean the conditions of the distribution of land are different, and these systems sweep round and round the world, only catching and affecting the south part of Tasmania, New Zealand, and Patagonia.

MOVEMENTS OF THE LOWER STRATA OF WATER

In 1894 I spoke of the movements of the lower strata of water in the sea as a subject on which we were only beginning to get a little light. Since that year we have learnt a little more. It is a common idea that at the bottom of the sea all is still; but this is a mistake, even for the deepest parts, for the tidal influence reaches to the bottom and keeps every particle in motion, though such motion is quiet and slow.

Near the shore, however, though still in deep water, the movement may be considerably increased. Cases have occurred in late years where submarine cables have broken several hundred fathoms deep, and when picked up for repair it has been found that the iron wire covering has been literally rubbed away as by a file. This can only be the result of an undercurrent along the bottom moving the cable to and fro. Such a current might be caused by a submarine spring, for there is no doubt that much fresh water finds its way into the ocean in this fashion, but it is more probably generally an effect of acceleration of the tidal movement due to the rising slope of the continent. In connection with this, further facts have come to light in the course of recent marine surveys.

Many isolated shoal spots in the great oceans have figured in our charts, the results of reports by passing sailors who have said they have seen breakers in fine weather.

Such places are the terror of seamen, and it is part of the duty of surveying ships to verify or disprove them. Very much has been done in the last eighteen years, with the result that the majority of them have, as dangers, disappeared. In many cases, however, a bank has been found, deep in the ordinary acceptation of the word, but much less deep than the surrounding sea—solitary ridges, in fact, rising from the ocean floor. Frequently, in examining these banks in search of shoaler spots, breakers have been reported and recognized as such on board the surveying ship from a distance, but on approach they have proved to be small overcurls caused by tide ripplings, and the depth of water has proved to be several hundred fathoms. These ripplings are clearly caused by the small tidal motion in the deep water, generally in these cases of more than 2,000 fathoms, meeting the slope of the submerged mountain range, being concentrated and accelerated until the water finally flows up the top of the slope as a definite current, and taking the line of least resistance, that to the surface, makes itself visible in the shape which we are accustomed to associate with comparatively shallow water.

These cases form remarkable instances of the manner in which extensive motion of water may arise from very small beginnings.

An observation I was anxious to make in 1894 has been successfully carried out since. This was to ascertain whether there was any permanent undercurrent in the Straits of Bab-el-Mandeb due to more water being forced through the straits on the surface by the persistent

southeast wind of winter than could be evaporated in the closed Red Sea.

Such return undercurrents have in somewhat similar circumstances been shown to exist in the Dardanelles, Strait of Gibraltar, and in the Suez Canal.

The observation at Bab-el-Mandeb was difficult. The wind is strong and the disturbance of the sea is considerable, while the water is 120 fathoms, or 700 feet, deep. But a surveying vessel maintained herself at anchor there during four days, and, by the aid of an ingenious apparatus sent from England for the purpose, clearly proved the existence of a current of 1½ knots flowing steadily at depths below 70 fathoms out of the Red Sea, while in the upper strata there was a similar current flowing in. In such ways is interchange of water provided for by nature in places where tidal action does not suffice.

MARVELOUS PROGRESS OF AFRICA

In what I fear is a very discursive address I have not mentioned the interior of Africa. In the first place, it is a subject of itself; and as we shall have, I hope, many papers on African subjects, I have thought it better to deal mainly with generalities.

Still I cannot refrain from a few words to express the astonishment I always feel when I hear people complain that Africa goes slow. When I look at what has been effected in my own lifetime, it appears to me that, on the contrary, it has been rushed. The maps I learned from as a boy showed the whole interior as a blank. There are now no parts that are not more or less known. The great lakes have all been revealed; the great rivers have all been traced; Europeans are now firmly fixed with decent governments in parts formerly a prey to tribal wars and the atrocities of the inland slave traffic. Railways are running over regions unknown forty years ago, and one of the most astonishing things to me is that I should be able to hope now to visit in comfort and luxury the great Victoria Falls, which my old friend Sir John Kirk—whom I left the other day hale and hearty—was, with the exception of Livingstone, the first white man to see, after a long and laborious journey in his company in 1860.

I could not help being amused as well as interested at seeing a short time ago a proclamation by the government of Northern Rhodesia, dated not far from Lake Bangweolo, calling on all concerned to observe neutrality during the present war between Russia and Japan. I think that if any one had prophesied to Livingstone, as he lay in 1873 lonely and dying by the shores of that newly discovered lake, that such an edict would be issued in thirty years he would have expressed a doubt as to its fulfillment.

To southern Africa nature has denied two of the features that facilitate rapid progress—good harbors and sufficient rainfall—but the energy of man has done wonders to provide the former where possible, and will doubtless do more, while I believe that the lack of the latter will also be overcome in the same way. The coördinated—or, in other words, the scientific—observations made in many other countries have pointed out a possible solution. On the other hand, the height of the inland plateaux makes it possible for the white man to live and work in latitudes which would under other conditions be tropical.

South Africa must have a great future before it; and, while some present circumstances may delay development of its natural advantages, I am inclined to think that in the long run prosperity may be more solid and material for being reached in the face of difficulties, as has so often occurred in the history of the world.

THE SUPPOSED BIRTHPLACE OF CIVILIZATIONS

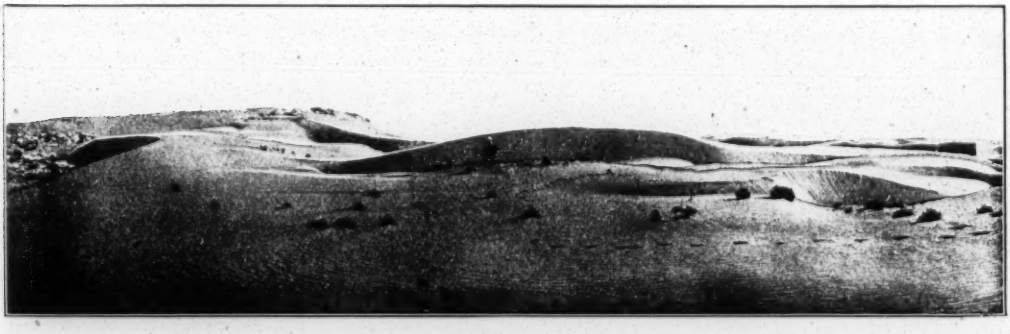
IT can be stated without exaggeration that in central Asia, particularly in Russian Turkestan, there are hundreds, perhaps thousands, of square miles of buried towns and cities. What processes of nature converted the region from a Garden of Eden, filled with millions of prosperous and wealthy people, into waterless wastes, inhabited only by nomads, are mysteries, to solve which little attempt has been made until recently.

Mr Raphael Pumpelly, known so widely for his work in China, suggested to the Carnegie Institution in 1902 that an examination of the Turkestan ruins might (1) reveal the birthplace of civilization, (2) show how changes in man's environment alter man himself, and (3) give a clue to recent geological time, which is now more or less told by guessing. Inasmuch as geological changes have occurred in central Asia since man has lived there, evidence may be discovered among the traces left by the earlier inhabitants which will tell how long these changes were in the making.

The Carnegie Institution gave Mr Pumpelly a grant sufficient to enable him to make an extended reconnaissance of Turkestan. Mr Pumpelly was accompanied by Prof. William M. Davis, of Harvard University, and Mr Ellsworth Huntington. The results have just been published in a special volume by the Carnegie Institution.* In view of the exceeding importance of the investigation, we make the following liberal quotations from Mr Pumpelly's report:

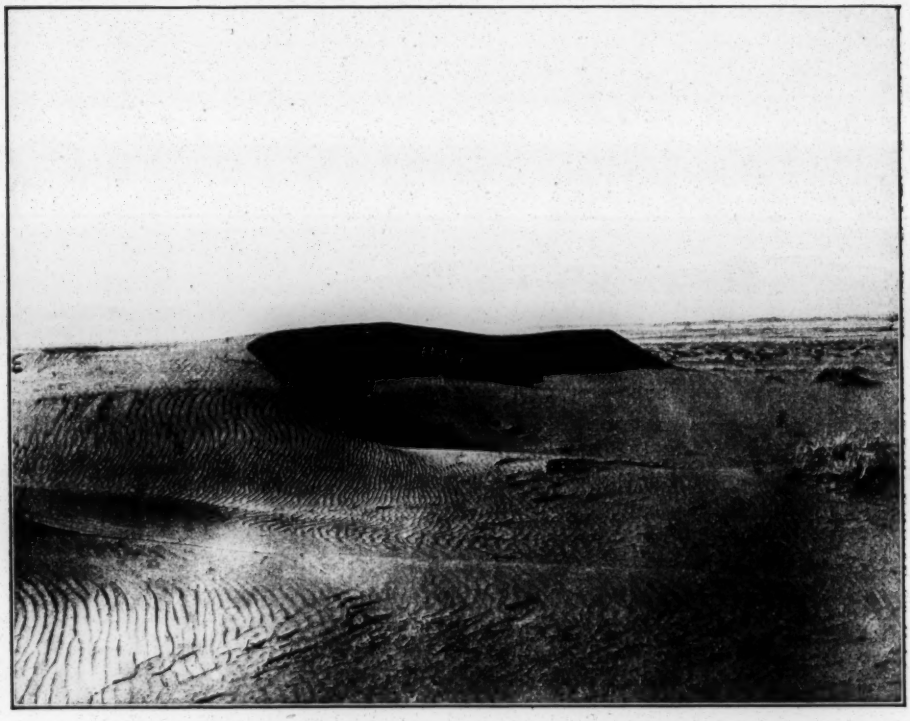
The investigation was proposed because (1) there is a school that still holds the belief that central Asia is the region in which the great civilizations of the Far East and of the West had their origin; and (2) because of the supposed occurrence in that region, in prehistoric times, of great changes of climate, resulting in the formation and recession of an extensive Asian Mediterranean, of which the Aral, Caspian, and Black seas are the principal remnants.

*Explorations in Turkestan, by Raphael Pumpelly, William M. Davis, and Ellsworth Huntington, with 174 illustrations and maps. Pp. 325, 9 x 12 inches. Washington, Carnegie Institution, 1905.



Paikent, a Sand-buried City

The ruins of Paikent represent the type of cities abandoned for lack of water and then buried by the progressive desert sands. Paikent was a great center of wealth and of commerce between China and the west and south till in the early centuries of our era. The recessions of the lower ends of the Zerafshan River brought its doom. Now only the citadel mound and the top of parts of its walls rise above the waves of the invading sands.



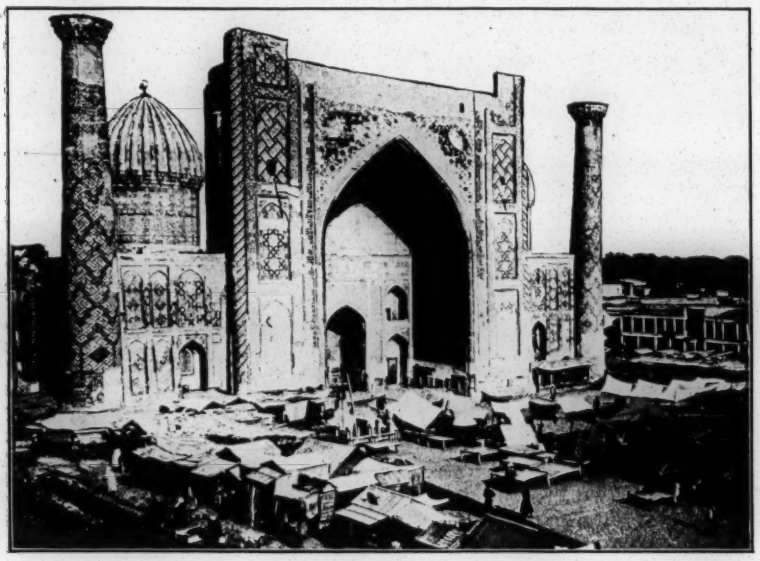
From Wm. M. Davis, Carnegie Institution

A Sand Dune Advancing Across the Desert

It had long seemed to me that a study of central Asian archeology would probably yield important evidence in the genealogy of the great civilizations and of several at least of the dominant races, and that a parallel study of the traces of physical changes during Quaternary time might show some coincidence between the phases of social evolution and the changes in environment; further, that it might be possible to correlate the physical and human records and thus furnish a contribution to the scale of recent geology.

While we have been surprised at the abundance of the data in natural and artificial records offered by the region toward these solutions, we are impressed with a realization of the intimate relation in which this region stands to the Quaternary and prehistoric history of the whole continent. Physically it forms part of the great interior region extending from the Mediterranean to Manchuria, whose history has been one of porgressive desiccation, but in Russian Turkestan the effects of this have been mitigated by the snows of the lofty ranges and the lower altitude of the plains.

Archeologically this region has, through a long period, been a center of production and commerce, connecting the eastern, western, and southern nations, and its accumulating wealth has made it repeatedly the prey of invading armies. It has been from remote time the field of contact and con-



From Wm. M. Davis, Carnegie Institution

A Mosque of Mediæval Samarkand

The ruins of Samarkand are very extensive. Its position must have made it an important center for commerce and wealth probably throughout the whole period of prehistoric occupation, as it has been during historic times. Situated in the heart of the very fertile oasis of the Zerafshan River, it lies also on the most open and easiest caravan routes connecting China and eastern Turkestan with Afghanistan, India, and Persia. Samarkand has, even within the past two thousand years, been sacked, destroyed, and rebuilt many times. Like Merv, its rebuildings have often been on adjoining sites, and the determining of the whole area covered by these various sites remains to be made. There is evidence that it is very extensive.

As in all Turkestan, so at Samarkand, the older structures still standing are those of the Mohammedan period. The many immense and wonderfully decorated mosques built by Tamerlane, though now falling into ruin, belong among the wonders of the world; and this not only on account of their great size, but also because of the beauty of their decoration. Seen from Afrosiab, these ruins tower high above the rich foliage of the oasis city—evidence of the wealth of treasure that Tamerlane had accumulated in Turkestan within two centuries after Genghis Khan had sacked the country and massacred much of the population.

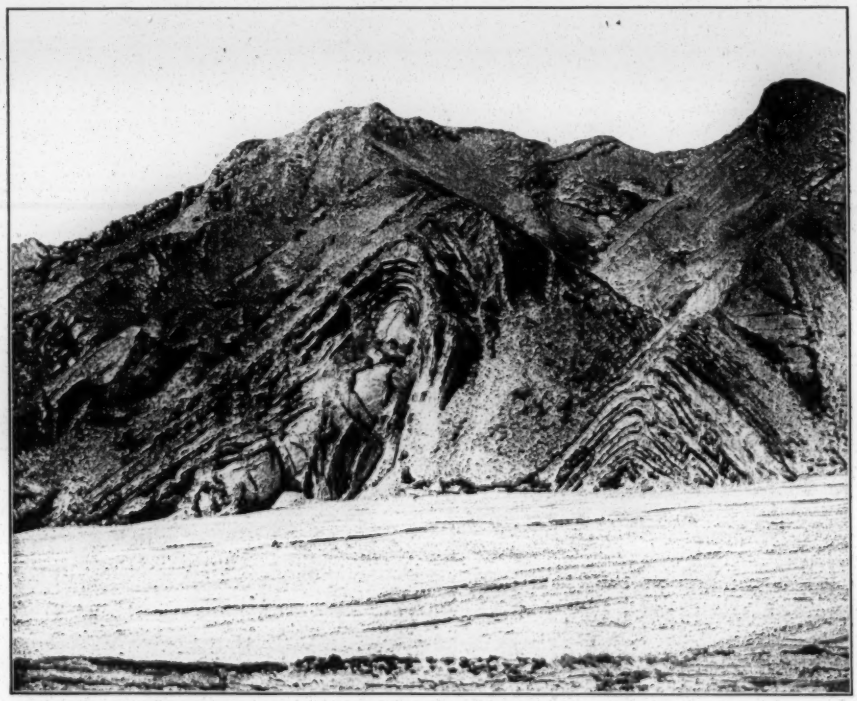
test between the Turanian and Aryan stocks; but its problems, both physical and archeological, are parts of the greater problem underlying the study of the development of man and his civilization on the great continent and of the environment conditioning that development.

The many fragmentary peoples surviving in the remote corners and in the protected mountain fastnesses of Asia, preserving different languages, arts, and customs, indicate a very remote period of differentiation, with subsequent long periods for separate development. They point also to the long periods of unrest and battling in which the survivors of the vanquished were forced into their present refuges. And this unrest was probably the remote prototype of that which in the later prehistoric and historic time sent out its waves from the Aralo-Caspian basin. It was probably from the beginning a condition in which the slowly progressive change toward

aridity in the interior Asia was ever forcing emigration outward, displacing other peoples, and thus working against the establishment of a stable equilibrium of population. Asia is thus the field for applying all the comparative sciences that relate to the history of man—the materials that lie in cave deposits, in rock pictographs, in tumuli, dolmens, and ruined towns, in languages, customs, religions, design patterns, and anthropological measurements.

Turkestan, from its geographical position, must have been the stage on which the drama of Asiatic life was epitomized through all these ages of ferment. Peoples and civilizations appeared and disappeared, leaving their records buried in ashes and earth; but the fertility of the soil produced wealth, and the position kept it ever a commercial center.

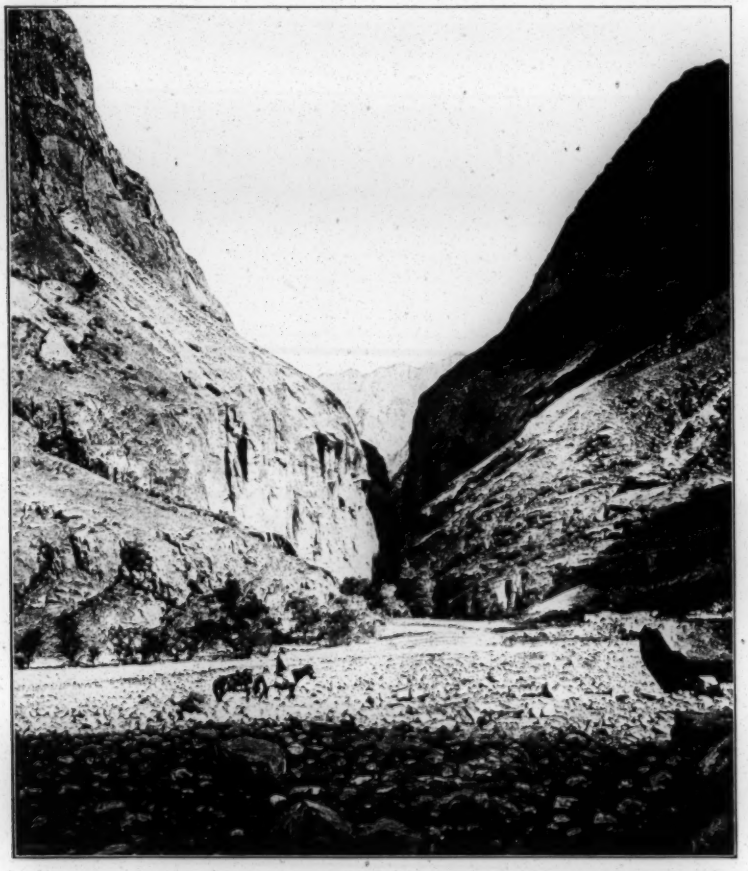
So far as our problems of archeology and physical geography are concerned, Turkestan is practically a virgin field. In geology and cartography the Russians have done a surprising amount of excellent work; but the modern methods of physico-geographic study have been only begun to be applied, and the little archeological work done there has been mostly in the nature of hunting curios and treasure, chiefly by foreigners, and in so destructive a manner that the Russian government has till now wisely prohibited excavations.



From Ellsworth Huntington, Carnegie Institution

Folds in the Limestone in the Sugun Valley west of Shor Kul, looking west

The thickness of made earth in the abandoned sites of Turkestan is sufficient to give reason for expecting evidences of very long-continued occupation. The dryness of the climate makes possible the preservation of any traces of written or incised documents that may have existed. Excavation conducted with the idea that everything met with—the earth itself, the character, the position, and association of fragments—is part of history cannot fail to be most fruitful in results.



From Ellsworth Huntington, Carnegie Institution

Limestone Gorge of the Western Kichik Alai

Where it enters the Ispairan River on the north side of the Alai Mountains. Probably the upper portion of the gorge was widened by a glacier, and the narrow slit at the bottom represents post-Glacial cutting. The main valley, from the side of which the photograph was taken, is clearly of glacial origin, and the side valley must have borne a hanging relation to that of the master stream.

We have shown that the recent physical history of the region is legibly recorded in glacial sculpture and moraines, in orogenic movements, in valley-cutting and terracing, in lake expansions, and

The Kirghiz in the Alai Valley

in the building up of the plains, and we have made some progress in correlating these events.

We have also found full confirmation of the statements as to a progressive desiccation of the region of long standing which has from a remote period continually converted cultivable lands into deserts and buried cities in sand.

We have found widely distributed great and small abandoned sites of human occupation with evidences of great antiquity.

We have reason to think that a correlation of these physical and human events may be obtained through continuance of the investigation, and that archeological excavations will throw light on the origin of Western and Eastern civilizations.

PROPORTION OF CHILDREN IN THE UNITED STATES

MANY interesting suggestions as to the probable tendency of the birth rate in the United States are offered in a bulletin by Walter F. Willcox entitled "Proportion of Children in the United States," recently published by the Bureau of the Census.

At the beginning of the nineteenth century the children under 10 years of age constituted one-third and at the end less than one-fourth of the total population. The decrease in this proportion began as early as the decade 1810 to 1820, and continued uninterruptedly,

though at varying rates, in each successive decade. This of itself, however, is not enough to prove a declining birth rate, as the decrease in the proportion of children in the total population may indicate merely an increase in the average duration of life and the consequent survival of a larger number of adults.

But by taking the proportion of children to women of child-bearing age we are able to get a more satisfactory index of the movement of the birth rate. Between 1850 and 1860, the earliest decade for which figures can be obtained, this proportion increased. But since 1860 it has decreased without interruption. The decrease has been very unequal from decade to decade, but if twenty-year periods are considered, it has been very regular. In 1860 the number of children under 5 years of age to 1,000 women 15 to 49 years of age was 634; in 1900 it was only 474. In other words, the proportion of children to potential mothers in 1900 was only three-fourths as large as in 1860. One is thus led to the conclusion that there has been a persistent decline in the birth rate since 1860.

No attempt is made by the author of the bulletin to determine the probable causes of this decline. An extended argument by Gen. Francis A. Walker is given, suggesting that it is largely due to the influx of foreigners and the resultant shock to the population instinct of the natives. Professor Willcox does not express a definite opinion, claiming that the vital statistics of the United States are not sufficiently developed to afford a sound basis of judgment. He notes, however, that there has been a similar marked decline in the birth rate of Australia, where there has been no such torrent of immigration.

DECLINE GREATEST IN NORTH AND WEST

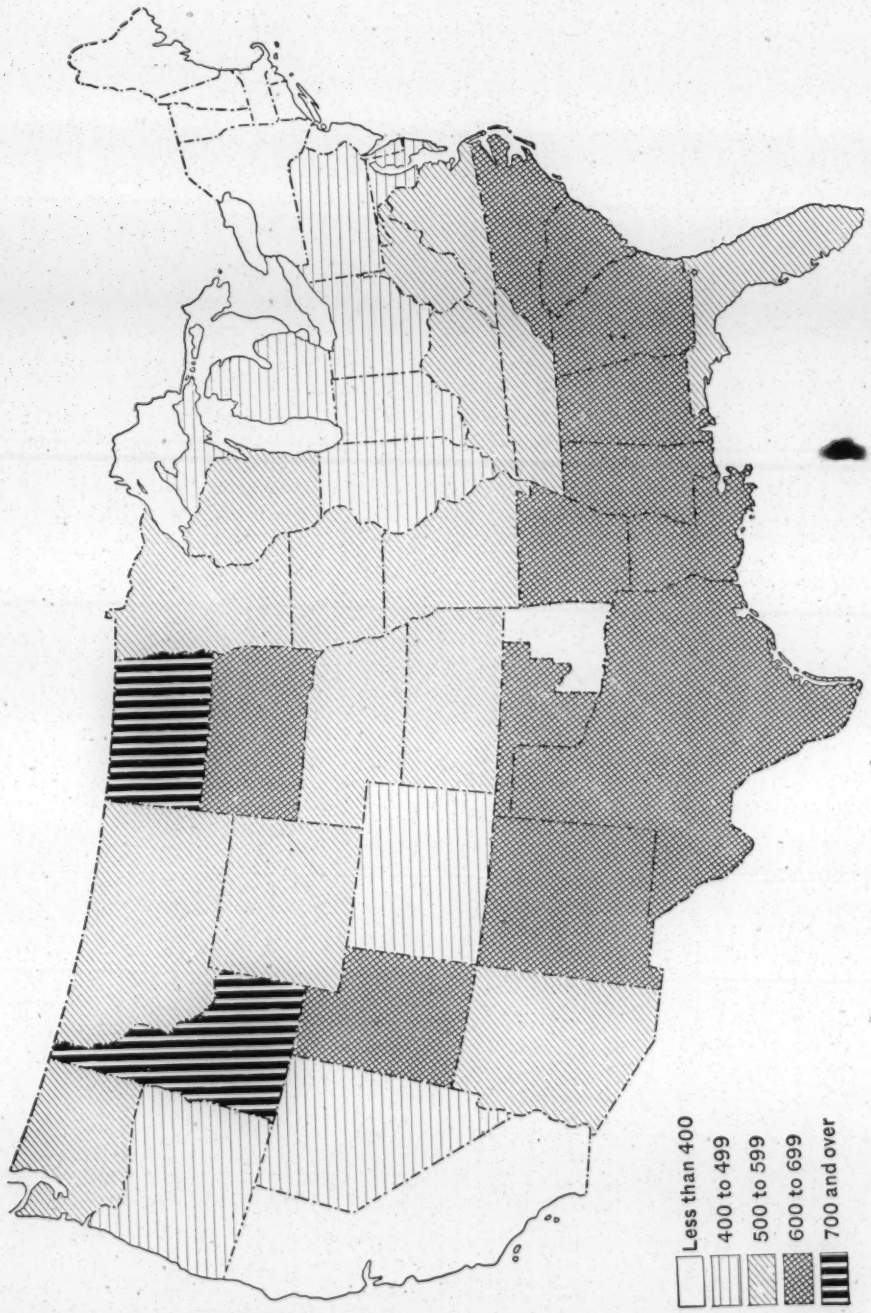
If this decline were due in large part to the influx of immigrants, we should expect it to be greatest in those sections of the country to which most of the immigrants have gone—greater in the North and West than in the South. It is found, in fact, that in the North and West there has been a more or less regular decline, while in the South the change has been less regular and the decline less marked. In 1850 the proportion of children to 1,000 women in the North and West was five-sixths of what it was in the South; in 1900 it was less than three-fourths.

In 1900 the smallest proportion of children was in the District of Columbia, where the number of children under 5 was hardly more than one-fourth the number of women of child-bearing age. But from the sociological standpoint the District of Columbia should be classed with cities rather than with states and territories. The next smallest proportion was that for Massachusetts, where it was slightly more than one-third. The largest proportion was in North Dakota and Indian Territory, in each of which it was two-thirds.

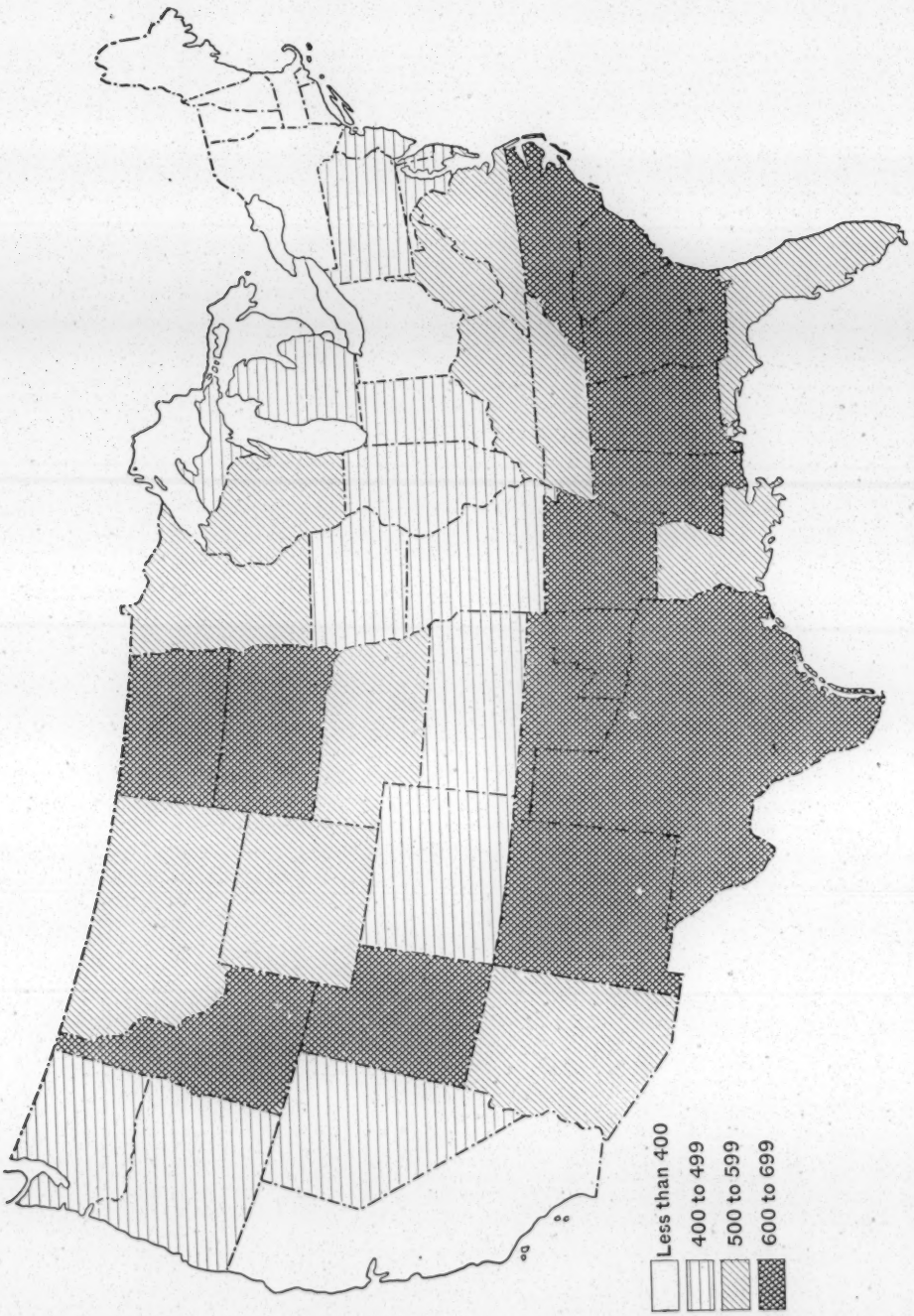
There was an unusual decrease in the proportion of children between 1860 and 1870, which must be attributed to the direct and indirect results of the civil war.

PROPORTION OF CHILDREN AMONG WHITES

The decrease in the proportion of white children under 10 to the total white population began as early as the decade 1810 to 1820, and has continued without interruption, but with varying rapidity, to the end of the century. The greatest decreases were found in the decades of greatest immigration, and may have been due in part to the disproportionate number of adults in the new immigrant population. The decreases in the decades 1850 to 1860 and 1890 to 1900 were very slight. The fact that these were the decades immediately following the great waves of immigration suggests that the check in



Number of Children under 5 Years of Age to 1,000 Females 15 to 49 Years of Age: 1890



Number of Children under 5 Years of Age to 1,000 Females 15 to 49 Years of Age: 1900

the decrease was due to the large number of children born to the immigrants after they found homes and became settled.

PROPORTION OF CHILDREN AMONG NEGROES

The figures for negroes are not given separately, but are included with those for Indians and Mongolians. The negroes, however, constitute so large a proportion of the total that we are justified, in most cases at least, in accepting these figures as representing conditions among negroes. In the last twenty years the decline in the proportion of negro children has been especially rapid. The proportion of children among negroes was greater than that among whites at every census except that of 1870.

PROPORTION OF CHILDREN GREATER IN COUNTRY DISTRICTS THAN IN CITIES

In 1900, for the United States as a whole, the proportion of children was only two-thirds as great in cities as in the country districts. In the North Atlantic division, however, it was almost as great in the cities as in the country. In the Southern divisions it is hardly more than half as large in the cities as in the country, while in the Far West the difference is intermediate in amount. "This is probably due in large measure to the fact that the immigrant population who have been swarming into the northern cities of recent years, especially into the cities of the North Atlantic states, have been multiplying by numerous births with much rapidity, while the corresponding laboring class which has immigrated to southern cities from the surrounding country districts has not been thus increasing."

GREATER FECUNDITY OF FOREIGN-BORN WOMEN

A comparison is made between the proportion of children born of native mothers to 1,000 native women of child-bearing age and the proportion of children born of foreign-born mothers to 1,000 foreign-born women of child-bearing age. In 1900 the former proportion was 462, the latter 710, the difference indicating the greater fecundity of foreign-born women. The comparison also indicates that the total decrease in fecundity of white women between 1890 and 1900 was the result of a decrease for native white women partly offset by an increase for foreign-born white women.

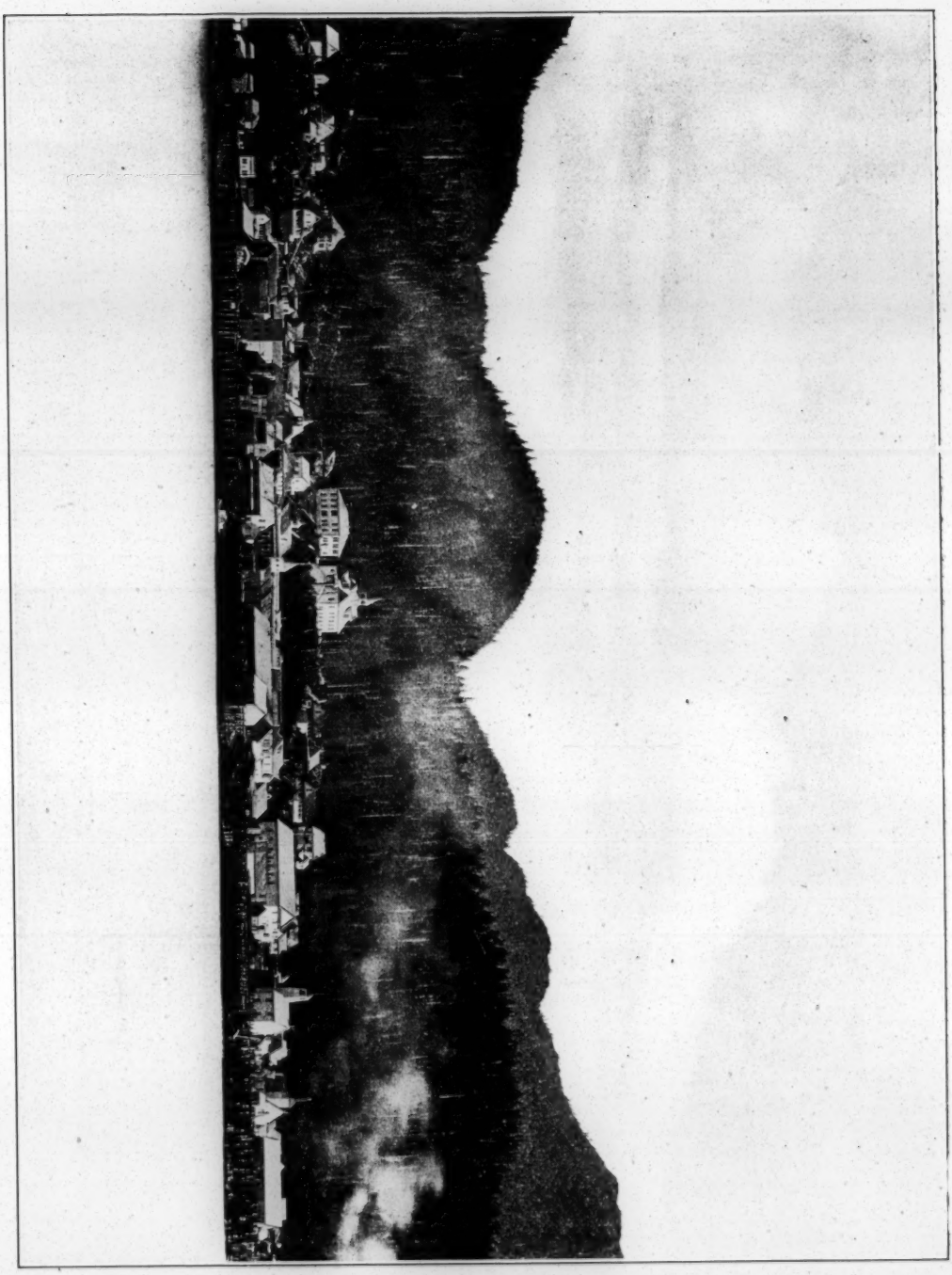
KETCHIKAN

THE thriving town of Ketchikan is the first call port of all the American steamers which follow the inland passages between Puget Sound and Alaska. Owing to this fact and its growing importance as a mining center, it will doubtless soon be included among the towns which are connected with the government cable system, but at present it is dependent on its postal facilities for communication with the rest of the world.

The photograph which we publish was taken last summer, and shows in the center of the picture its pride, the public school-house on the hill. The town is about fifty miles north of the boundary and is situated on Revillagigedo Island, on the north side of Tongass Narrows.

What effect the establishment of the trans-Pacific terminal of the Grand Trunk Railroad near Port Simpson will have on Ketchikan cannot be foretold, but in all probability it will serve to increase its importance.

O. H. T.

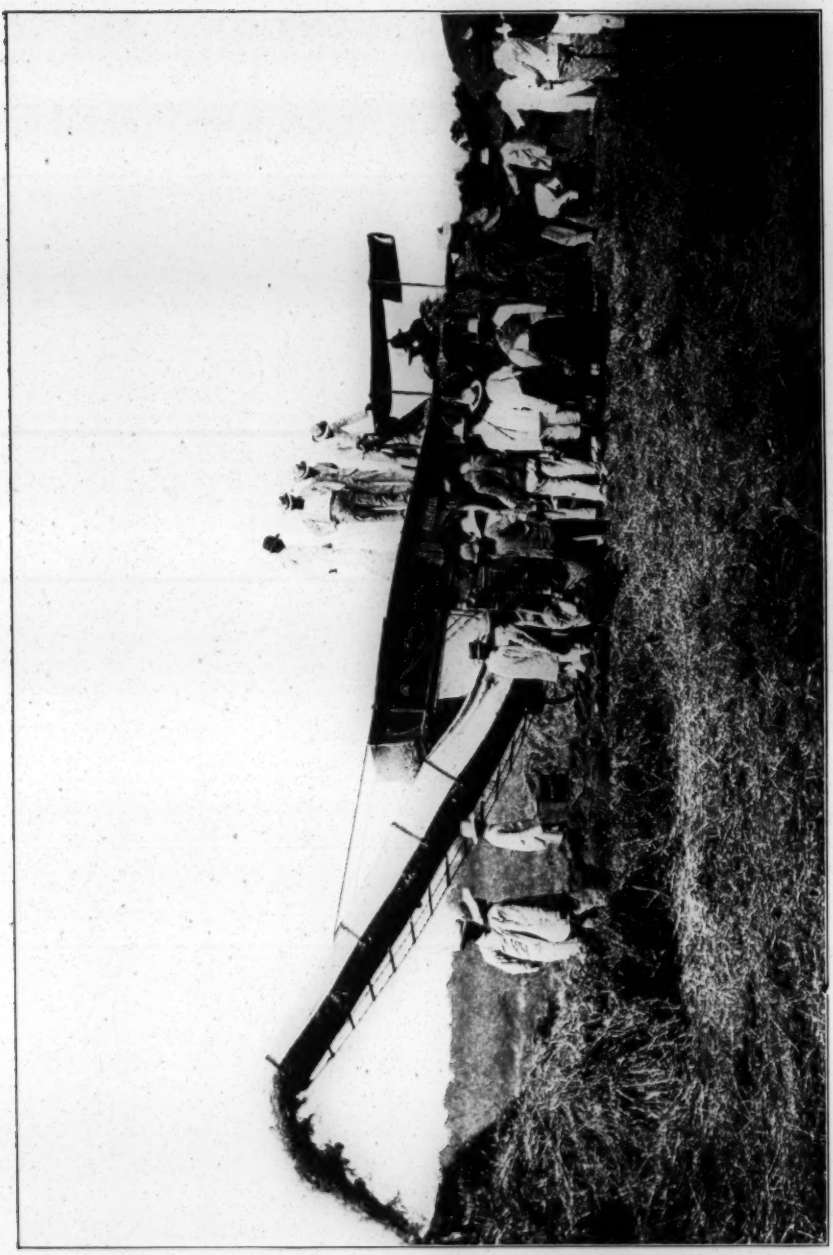


The Town of Ketchikan, Alaska, in the Spring of 1905

Photo by O. M. Leland, U. S. Coast and Geodetic Survey

Philippine Method of Threshing Rice, Government Rice Farm, Murcia

Treading out the grain (see page 514)



Threshing Rice with American Machinery, Government Rice Farm, Murcia

From Alfred H. Brooks, U. S. Geological Survey

Map of Alaska, showing Mineral Deposits so far as known

THE RETURNS FROM ALASKA

WE are getting more gold out of Alaska each year than the territory cost us in 1867. In 1904 $9,000,000 of the yellow metal were shipped to the United States from Alaska. Of this sum $6,000,000 were from placer deposits and the balance from lode deposits. Big as is the present output from the gold placers, Mr Alfred H. Brooks, of the Geological Survey, estimates that the amount will be doubled in a few years. The Cape Nome fields are still in the lead, but the Fairbanks district is being developed very rapidly.

The great need of the territory at the present time is some roads. There are not more than 50 miles of road in Alaska, and these were built by private enterprise. The expenditure of $1,000,000 in constructing a few trunk lines would be many times repaid in increased gold production. Many of the fields cannot now be worked profitably because of the cost of transporting machinery and provisions.

A hundred feet of 8-inch 16-gage hydraulic riveted steel pipe costs in Fairbanks $175. On Fairbanks Creek, 20 miles away, the same 100 feet of pipe, with freight at 20 cents per pound, costs, if transported in summer, $301, representing a freight charge of $126. In the Klondike, where the topography is nearly the same, the same pipe would be landed on a claim 20 miles from Dawson for a freight charge of $9.45.*

Already over 300 miles of wagon road have been built by the Canadian government in the Yukon territory and the Atlin district of British Columbia, while over 600 miles of sled roads have been made in the Yukon territory. The fact that in the summer wagons and vehicles of all descriptions, and even bicycles, may be seen daily about Dawson, the Klondike creeks, and Atlin, in British Columbia, while the winter roads in Canadian territory afford continuous easy routes for horse sleds down the Yukon to Dawson, is evidence of the success of the Canadian road-building enterprise.

Four important reports on the mineral resources of Alaska have been recently published by the U. S. Geological Survey: "Mineral Resources in Alaska in 1904" (Bulletin 259), by Alfred H. Brooks, C. W. Purington, F. E. and C. W. Wright, Arthur C. Spencer, Arthur J. Collier, George C. Martin, L. M. Prindle, and Ralph W. Stone. The bulletin describes progress in developing the gold, coal, petroleum, and tin resources. "Fairhaven Gold Placers, Seward Peninsula" (Bulletin 247), by Fred H. Moffit, with two large new maps (one geologic and one topographic) of northeastern portion of Seward Peninsula. "Gold Placers of Forty-Mile, Birch Creek, and Fairbanks Regions" (Bulletin 251), by Louis M. Prindle, with a reconnaissance map of the Yukon Tanana region. "Methods and Costs of Gravel and Placer Mining in Alaska" (Bulletin 263), by C. W. Purington.

PROGRESS IN THE PHILIPPINES

THE Report of the Philippine Commission for 1904, which has just been published by the War Department in three volumes, gives an interesting account of the operations of a steam rice-thrasher which the insular government installed on the experimental farm in 1904. During the rice season the thrasher covered 125 miles and proved so popular that, in spite of the moderate toll charged, nearly $500 were cleared after paying all operating expenses. The natives obtained so much more grain by steam-thrashing that some of the ignorant thought that there was a devil in the machine, or that there must be some trickery in its operation.

The people in tramping out rice with

* Gravel and Placer Mining in Alaska," C. W. Purington, Bull. 263, U. S. Geological Survey, Washington, 1905, p. 227.

their feet or driving carabaos (see illustrations, pages 510–511) over it as a means of thrashing it, generally occupy the best part of three months in the work and suffer losses of rice in waste, stealage, leakage, etc., of 25 per cent of the entire crop. They thrash the crop so slowly in fact that in many cases they eat it up as fast as they thrash it. Their methods of hulling and cleaning are equally crude, and the valuable by-products, as well as much of the rice, are wasted. By thrashing the crop by steam-power the rice becomes a marketable commodity at once, and the farmer and his laborers have time to put in other crops. Several steam-thrashing outfits have been ordered by Filipinos.

"One curious trait of the Filipino," says Mr W. C. Welborn, chief of the Bureau of Agriculture, "seems to be that he is willing to buy what he has actually seen to be good; but one need not talk about any improvement or addition to what he has not seen. He will believe none of it, and wants what he has seen demonstrated—no more and no less. It is often charged that the Filipino will not work, and hence will never develop the country. I believe he now expends enough energy (largely unprofitably spent, carrying heavy burdens long distances, tramping out rice, cleaning it in mortars, and doing all manner of hard work in the crudest way) to make the country a garden if properly directed."

Some of the developments of the year were (1) improvements in the parks, buildings, and sanitation of Manila; (2) continued work on the harbor system, which when completed will enable Manila to "offer to the shipping of the world a safe and commodious harbor, with a minimum depth of 33 feet, which will undoubtedly be the best in the Orient;" (3) the completion of the Benguet road to the Bagino sanitary resort; (4) useful experiments in the introduction of American cattle, and improved and new varieties of agricultural products.

WE OCCUPY THE BEST POSITION ON THE MAP

A few paragraphs from the address of the Secretary of the Treasury, Hon. Leslie M. Shaw, to the American Bankers' Convention, Washington, October 11, 1905.

WE point with pride to our export trade of a billion and a half, and with our thumbs in the armholes of our waistcoats we contemplate our skill and foresight and our ability as international merchants.

Of our aggregate exports about $1,000,000,000 consists of raw cotton, food products, petroleum products, crude copper, lumber, and other raw materials and crude articles, of which we produce a surplus which the world not only needs, but must have.

The time is coming, gentlemen—with our increasing population more largely urban than ever, with factories multiplying more rapidly than farms, with limitless manufacturing resources and matchless aptitude for production—when the United States will need new and important markets. The world may come to us in its own ships for the products of our farms and the raw products of our mines, but it will not come in its own ships for the finished products of our factories. The time is coming when we will need international bankers and international merchants and an international merchant marine.

We occupy the best position on the map. We have the safest and most convenient form of money in the world. We speak the language of commerce. Our farms produce more than the farms of any other country. Our mines yield more gold literally by the carload, silver by the train load, and there is unloaded on the shores of a single commonwealth more iron ore than any other country produces. Our forests yield 100,000,000

feet of lumber for every day of the calendar year. Our factories turn out more finished products than all the factories of Great Britain and Germany combined by more than three thousand millions every twelve months. We transport this matchless product of farm and factory, forest and mine, from the interior to the sea at one-third what similar services cost anywhere else beneath the skies. We carry it from point to point along the coast in better vessels, on quicker time, and at cheaper rates than others.

But at our coast line we are brought to an abrupt halt. Here we are no longer independent. Our foreign commerce is four times as large as forty years ago, but we carry in our own ships only one-third as many gross tons as forty years ago. We have protected and encouraged every interest but our merchant marine, and every protected interest has flourished. We have every facility for international commerce except international merchants, international bankers, and an international merchant marine. Shall we not have these? I am not urging ship subsidies. I am speaking of results, not of methods. If we will but take advantage of our opportunities, we will send these products of farm and factory under every sky and into every port, and make our financial centers the clearing houses of at least a fraction of the world's trade.

FORESTS VITAL TO OUR WELFARE

From an Address by President Roosevelt at Raleigh, N. C., October 19, 1905

AND now I want to say a word to you on a special subject in which all the country is concerned, but in which North Carolina has a special concern. The preservation of the forests is vital to the welfare of every country. China and the Mediterranean countries offer examples of the terrible effect of deforestation upon the physical geography, and therefore ultimately upon the national well-being of the nations. One of the most obvious duties which our generation owes to the generations that are to come after us is to preserve the existing forests. The prime difference between civilized and uncivilized peoples is that in civilized peoples each generation works not only for its own well-being, but for the well-being of the generations yet unborn, and if we permit the natural resources of this land to be destroyed so that we hand over to our children a heritage diminished in value, we thereby prove our unfitness to stand in the forefront of civilized peoples. One of the greatest of these heritages is our forest wealth. It is the upper altitudes of the forested mountains that are most valuable to the nation as a whole, especially because of their effects upon the water-supply. Neither state nor nation can afford to turn these mountains over to the unrestrained greed of those who would exploit them at the expense of the future.

We cannot afford to wait longer before assuming control, in the interest of the public, of these forests; for if we do wait the vested interests of private parties in them may become so strongly intrenched that it may be a most serious as well as a most expensive task to oust them.

If the Eastern states are wise, then from the Bay of Fundy to the Gulf we will see within the next few years a policy set on foot similar to that so fortunately carried out in the high Sierras of the West by the national government. All the higher Appalachians should be reserved, either by the states or by the nation. I much prefer that they should be put under national control, but it is a mere truism to say that they will not be reserved either by the states or by the nation unless you people of the South show a strong interest therein.

Such reserves would be a paying investment, not only in protection to many interests, but in dollars and cents to the government. The importance to the

Southern people of protecting the Southern mountain forests is obvious. These forests are the best defense against the floods which in the recent past have, during a single twelve-month, destroyed property officially valued at nearly twice what it would cost to buy the Southern Appalachian reserve. The maintenance of your Southern water powers is not less important than the prevention of floods, because if they are injured your manufacturing interests will suffer with them. The perpetuation of your forests, which have done so much for the South, should be one of the first objects of your public men. The two Senators from North Carolina have taken an honorable part in this movement. But I do not think that the people of North Carolina or of any other Southern state have quite grasped the importance of this movement to the commercial development and prosperity of the South.

COTTON AND THE CHINESE BOYCOTT

From an address by President Roosevelt to the citizens of Atlanta, October 20, 1905

I AM glad to see diversifications of industry in the South, the growth of manufactures as well as the growth of agriculture, and the growing growth of diversification of crops in agriculture. Nevertheless it will always be true that in certain of the Southern States cotton will be the basis of the wealth, the mainstay of prosperity, in the future as in the past. The cotton crop is of enormous consequence to the entire country. It was the cotton crop of the South that brought $400,000,000 of foreign gold into the United States last year, turning the balance of trade in our favor. The soil and climate of the South are such that she enjoys a practical monopoly in the production of raw cotton. Under proper methods of distribution, it may well be doubted whether there can be such a thing as overproduction of cotton. Last year's crop was nearly fourteen million bales, and yet the price was sufficiently high to give a handsome profit to the planter. The consumption of cotton increases each year, and new uses are found for it.

At present our market for cotton is largely in China. The boycott of our goods in China during the past year was especially injurious to the cotton manufacturers. This government is doing, and will continue to do, all it can to put a stop to the boycott. But there is one measure to be taken toward this end in which I shall need the assistance of the Congress. We must insist firmly on our rights, and China must beware of persisting in a course of conduct to which we cannot honorably submit; but we in our turn must recognize our duties exactly as we insist upon our rights. We cannot go into the international court of equity unless we go in with clean hands. We cannot expect China to do us justice unless we do China justice. The chief cause in bringing about the boycott of our goods in China was undoubtedly our attitude toward the Chinese who come to this country. This attitude of ours does not justify the action of the Chinese in the boycott, and especially some of the forms which that action has taken. But the fact remains that in the past we have come short of our duty toward the people of China.

It is our clear duty, in the interest of our own wage-workers, to forbid all Chinese of the coolie class—that is, laborers, skilled or unskilled—from coming here. The greatest of all duties is national self-preservation, and the most important step in national self-preservation is to preserve in every way the well-being of the wage-worker. I am convinced that the well-being of our wage-workers demands the exclusion of the Chinese coolies, and it is therefore our duty to exclude them, just as it would be the duty of China to exclude American laboring men if they became in any way a menace to China by entering her country. The right is reciprocal, and in our

last treaty with China it was explicitly recognized as inhering in both nations.

But we should not only operate the law with as little harshness as possible, but we should show every courtesy and consideration and every encouragement to all Chinese who are not of the laboring class to come to this country. Every Chinese traveler or student, business man or professional man should be given the same right of entry to, and the same courteous treatment in, this country as are accorded to the student or traveler, the business man or professional man of any other nation. Our laws and treaties should be so framed as to guarantee to all Chinamen, save of the excepted coolie class, the same right of entry to this country and the same treatment while here as is guaranteed to citizens of any other nation. It is needed in our own interest, and especially in the interest of the Pacific slope and of the South Atlantic and Gulf states; for it is short-sighted indeed for us to permit foreign competitors to drive us from the great markets of China.

IMMIGRATION TO THE SOUTHERN STATES*

IN recent years, especially within the last ten, there has been a gradual but marked change of sentiment in the South in regard to the desirability of immigration. The South now wants it and is working hard to get it. The resources of the South have scarcely been touched, and under the most favorable circumstances it will require many generations to develop them. There are millions of acres of cotton, cane, rice, and tobacco lands that have never been cultivated. Louisiana alone has 19,000,000 acres of vacant land out of a total of 26,000,000; and it is estimated that not more than one-eighth of the cotton lands of the South are in cultivation. The mineral resources of the South are almost unlimited; it has more timber than any other section of the United States; in every Southern state there is water power never yet used, and there are ideal situations for market-gardening on the largest scale.

The negro cannot furnish either in quality or in quantity the labor necessary to develop the South. The progress of the South since the war has been almost wholly in the white districts.

Florida sends out lists of state lands, maps of the attractive portions of the state, and beautifully illustrated pamphlets relating to cattle-raising, lumbering, fruit and truck growing, fish and game, and winter resorts. Louisiana publishes free information concerning the climate, soil, resources, industries, schools, and churches, and sends out lists with descriptions and prices of 6,000,000 acres of land for sale. The other Southern states follow much the same methods. Most of the states have representatives in New York and in the West, whose business it is to disseminate information and secure immigration. The state immigration bureaus have had fair success.

Louisiana has probably secured the best results. The authorities confine their work principally in the middle West, aiming to attract substantial farmers rather than laborers. Since 1900 many Northern farmers have settled in Louisiana. In New Orleans, however, the work of the negro roustabouts, who loaded and unloaded the steamers at the wharves, became so unsatisfactory that whites from the West were brought in to supplant them. South Carolina has secured several settlements of Scotch, Canadians, and Germans, and is now trying to secure Scandinavians. Maryland secured 4,000 very desirable immigrants in one year at an expense of only $15,000.

The state authorities have been greatly aided by hundreds of immigration and

*A summary of an extremely interesting study by Prof. Walter L. Fleming, of the University of West Virginia, published by Ginn & Co.

development societies. Every commercial and industrial body acts also as an immigration society. In Louisiana alone there are more than one hundred; one of them has 7,000 acres of land for sale. The "colony" plan has also brought desirable immigrants to the South.

But the most potent factors in the immigration movement are the railroads. Each important railroad company has hundreds of thousands of acres of land for sale and wishes to see industries developed along its lines. Until within the last few years the North and South lines have not offered special rates to homeseekers except in colonies. Now, on the first and third Tuesdays in each month special homeseekers' rates are offered on every road east of the Rockies that runs into the South or the Southwest. These excursions have proved a great success. The Union station at St Louis is crowded every other Tuesday with men from the Northwest bound to the South and Southwest. On the night of September 15, 1903, the Iron Mountain road carried out of St Louis within two hours six special trains with three thousand homeseekers.

The South does not want the lower class foreigners who have swarmed into the Northern states; it wants the same sort of people who settled so much of the West. The newcomers from the Western states and from western Europe are not mere laborers. They work for themselves on their own holdings. In those parts of the South, however where unskilled labor is wanted to supplement the work of the blacks, such immigration will not solve the problem. One planter complained that he had land sufficient to produce 1,000 bales of cotton, but labor enough for only 300. He thought that the exclusion laws could be repealed if the Southern states should advocate the policy. It is certain, however, that the South will not tolerate the introduction of large numbers of Chinese, for fear of possible race complications.

The solution seems to be to induce the Italians to come in as farm laborers, with the prospect of becoming landowners on a small scale. They have come in larger numbers than other foreigners, and, much to the surprise of all, they have proved successful farmers on the cotton and sugar plantations. The great lumbering companies also are employing them. The north Italian is preferred, but the principal immigration is from southern Italy, Sicily, and the old Papal states. The numbers are constantly increasing. In Louisiana in 1900 there were 17,000 Italians; in 1904 there were 30,000. In 1904 it was estimated that more than 100,000 Italian farm laborers were working in the Southern states of the Mississippi Valley. Numbers come from Sicily or from the North to work during the cane-cutting season, and then return to the North or to Sicily. Between New Orleans and Baton Rouge the Italian laborer has largely displaced the negro, and the same is true of many other localities.

At Independence, Louisiana, in 1904, 275 car-loads of strawberries, valued at $500,000, were produced by Italian laborers. These colonists have begun to purchase little farms, have good homes, and money in the bank. The younger ones do not expect to return to Italy. A tract of 1,600 acres of land in this community sold, in 1879, for $1,600; in 1904, 200 acres of the same tract sold for $10,400. In the same community other pieces of the land have risen in value from $1 to $50 per acre within two years. Many planters have substituted Italians for negroes as tenants. The former are not criminal, are prompt to pay debts, and have improved morally as well as materially since they arrived in America.

In conclusion, it may be said that immigration to the South seldom reaches the black belt. There seems to be a dislike of contact with the negro.

Where newcomers enter the black belt they go in colonies, settle near the railroad, and dispense with the negro. Much of the immigration does not increase the population of a community; it simply displaces the negro. Compared with the great volume of immigration to the West and North, the numbers that go South are insignificant; but compared with the numbers that went South ten years and more ago, the recent movement is very important. There is plenty of vacant land, and the Southerners say that if a million settlers have come and are satisfied, there is no reason why other millions may not come.

AN IMPORTANT GEOGRAPHIC PUBLICATION

THE report of the Eighth International Geographic Congress, which met in the United States in September, 1904, has just appeared from the Government Printing Office, and copies are now being distributed to the members of the Congress. The volume makes a book of 1065 pages, illustrated by maps, diagrams, and photographs, and contains 148 papers and abstracts contributed by geographers from all parts of the world. It is one of the most valuable additions to geographic knowledge published during recent years. The expense of publication has been paid by the United States government in accordance with an act of Congress passed March 3, 1905. A useful feature of the report is the arrangement of the proceedings by means of which any act of the Congress may be readily found. The arrangement is: History of the Congress, organization, with officers, committees, lists of members, of associate members, and of delegates and institutions represented, and a summary of membership and attendance, diary of the Congress, minutes of the general meetings, minutes of the meetings of the presidency, addresses, reports of committees and resolutions adopted, and papers. Ten of the papers included in the volume have been published in this magazine. The following titles show the wide range of subjects discussed in the report:

Scientific Exploration of Caves. Prof. E. A. Martel.

The Valleys and Lakes of the Alps. Dr Albrecht Penck.

The Geography of Alaska. Mr A. H. Brooks.

A Climatological Dictionary for the United States. Prof. A. J. Henry.

The Canadian Climate. Prof. R. F. Stupart.

Evidences of Land Near the North Pole. Prof. R. A. Harris.

Glacial Exploration in the Montana Rockies. Prof. L. W. Chaney.

Geographic Work of the U. S. Coast and Geodetic Survey. Messrs W. C. Hodgkins and G. R. Putnam.

Evidence in Favor of the Former Connection of Brazil and Africa. Prof. Charles C. Adams.

The Conditions of Man's Origin. Dr Leonidas Chalikiopoulos.

The Peoples of the Philippines. Mr Henry Gannett.

Africa Between the River Juba and the Nile. Dr A. Donaldson Smith.

A Comparative View of the Arctic and Antarctic. Dr Frederick A. Cook.

The Everglades of Florida. Rev. J. N. MacGonigle.

Geography of the Pan-American Railway. Charles M. Pepper.

Future Explorations in Australia. Prof. David Lindsay.

Maps: Handling, Classifying, Cataloguing. Thomas Letts.

Some Recent Governmental Influences upon the Geographic Conditions of Commerce. Prof. Emory R. Johnson.

Rise and Development of the German Colonial Possessions. Graf von Pfeil.

The Economic Importance of the Plateaus in Tropic America. Prof. J. R. Smith.

The Atlantic Ferry. Capt. D. J. Kennelly.

The Caribbean Sea Regions and Their Resources. Francis C. Nichols.

A Plea for the Establishment of a Commercial Game and Fur Preserve in the Northwest. Dr Townsend W. Thorndike.

Geography and History in the United States. Prof. Albert P. Brigham.

IRRIGATION REPORTS

THE following Water-Supply and Irrigation Papers have been issued recently by the U. S. Geological Sur-

vey. Of these 4,000 copies have been delivered to Senators and Representatives in Congress and 1,500 copies to the Survey for general distribution. Applications can be made for them either to members of Congress or to the Survey. Requests specifying certain papers and stating reasons for asking for them are granted whenever practicable, but it is impossible to comply with a general demand for all of the series, as no mailing list is maintained.

109. Hydrography of Susquehanna River Basin. J. C. Hoyt and R. H. Anderson.

110. Contributions to Hydrology of Eastern United States, 1904. M. L. Fuller, Geologist in Charge.

111. Preliminary Report on Underground Waters of the State of Washington. Henry Landes.

112. Underflow Tests in Basin of Los Angeles River. Homer Hamlin.

113. The Disposal of Strawboard aud Oil Wastes. R. L. Sackett and Isaiah Bowman.

114. Underground Waters of Eastern United States. M. L. Fuller, Geologist in Charge.

115. River Surveys and Profiles Made During 1903. W. C. Hall and J. C. Hoyt.

116. Water Problems of Santa Barbara, Cal. J. B. Lippincott.

117. The Lignite of North Dakota and Its Relation to Irrigation. F. A. Wilder.

118. Geology and Water Resources of a Portion of East-Central Washington. F. C. Calkins.

119. Index of Hydrographic Progress Reports of the U. S. Geological Survey. J. C. Hoyt and B. D. Wood.

120. Bibliographic Review and Index of Papers Relating to Underground Waters Published by the U. S. Geological Survey. M. L. Fuller.

121. Preliminary Report on the Pollucion of Lake Champlain. M. O. Leighton.

122. Relation of the Law to Underground Waters. D. W. Johnson.

123. Geology and Underground Water Conditions of the Jornado del Muerto, New Mexico. C. R. Keyes.

124. Atlantic Coast of New England Drainage.

125. Hudson, Passaic, Raritan, and Delaware River Drainages.

126. Susquehanna, Patapsco, Potomac, James, Roanoke, Cape Fear, and Yadkin River Drainages.

127. Santee, Savannah, Ogeechee, and Altamaha Rivers, and Eastern Gulf of Mexico Drainages.

128. Eastern Mississippi River Drainage.

129. Great Lakes and St Lawrence River Drainage.

130. Hudson Bay, Minnesota, Wapsipinicon, Iowa, Des Moines, and Missouri River Drainages.

131. Platte, Kansas, Meramec, Arkansas, and Red River Drainages.

132. Western Gulf of Mexico Drainage.

133. Colorado River and the Great Basin Drainage.

134. The Great Basin and Pacific Ocean Drainages in California.

135. Columbia River and Puget Sound Drainage.

136. Underground Waters of Salt River Valley. W. T. Lee.

137. Development of Underground Waters in the Eastern Coastal Plain Region of Southern California W. C. Mendenhall.

138. Development of Underground Waters in the Central Coastal Plain Region of Southern California. W. C. Mendenhall.

139. Development of Underground Waters in the Western Coastal Plain Region of Southern California. W. C. Mendenhall.

140. Field Measurements of the Rate of Movement of Underground Water. C. S. Slichter.

141. Observations on the Ground Waters of Rio Grande Valley. C. S. Slichter.

142. Hydrology of San Bernardino Valley, California. W. C. Mendenhall.

143. Experiments on Steel-concrete Pipes. J. H. Quinton.

144. The Normal Distribution of Chlorine in the Natural Waters of New York and New England. D. D. Jackson.

145. Contributions to the Hydrology of Eastern United States, M. L. Fuller, geologist in charge.

146. Proceedings of Second Reclamation Conference. Compiled by F. H. Newell.

147. Destructive Floods in the United States in 1904. E. C. Murphy and others.

Commercial Geography. By Henry Gannett, Carl Louise Garrison, and Edwin J. Houston. With maps and illustrations. Pp. 420. 5¾ x 8 inches. New York: American Book Company. 1905. $1.00.

Now that the exploration of the world is practically completed, and the acquisition of land by conquest is becoming more difficult each year, the struggle for commercial supremacy becomes principally a matter of education and training. Germany, realizing this fact some years

From Gannett, Garrison, and Houston's "Commercial Geography"
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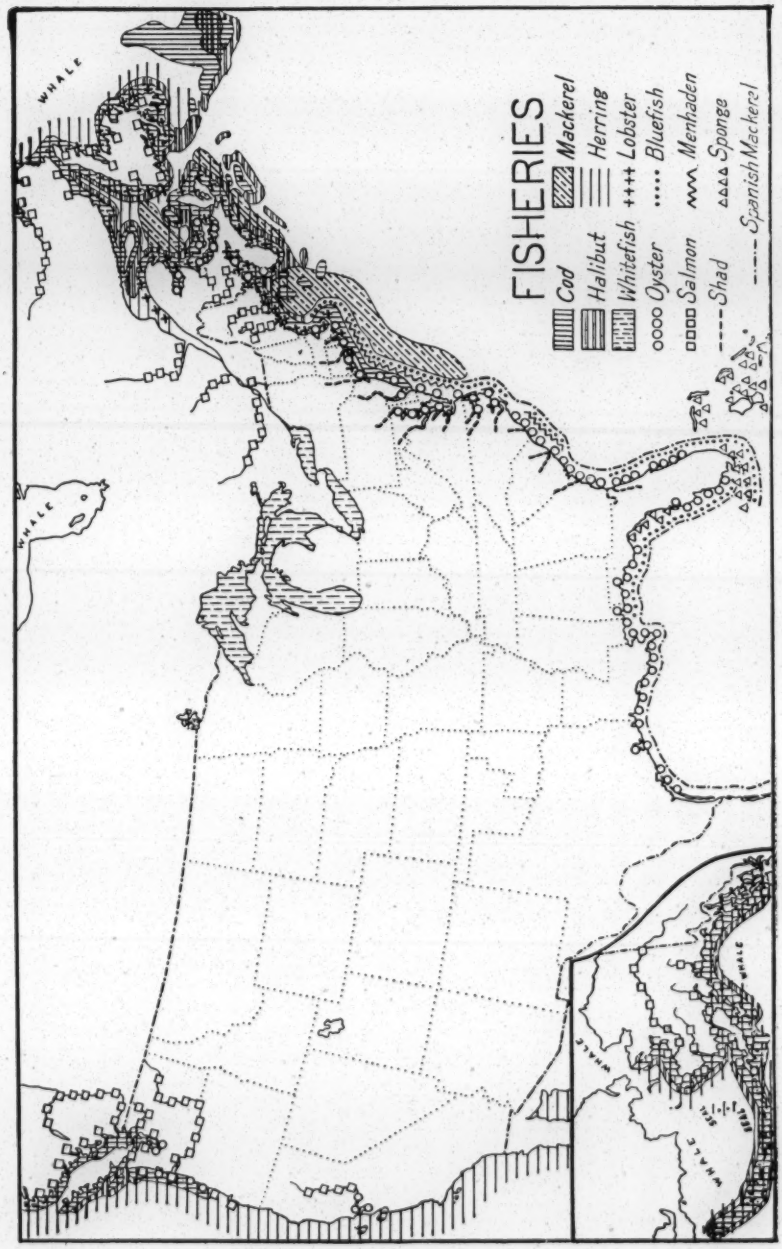
Relative Density of Railroads in United States and Europe.



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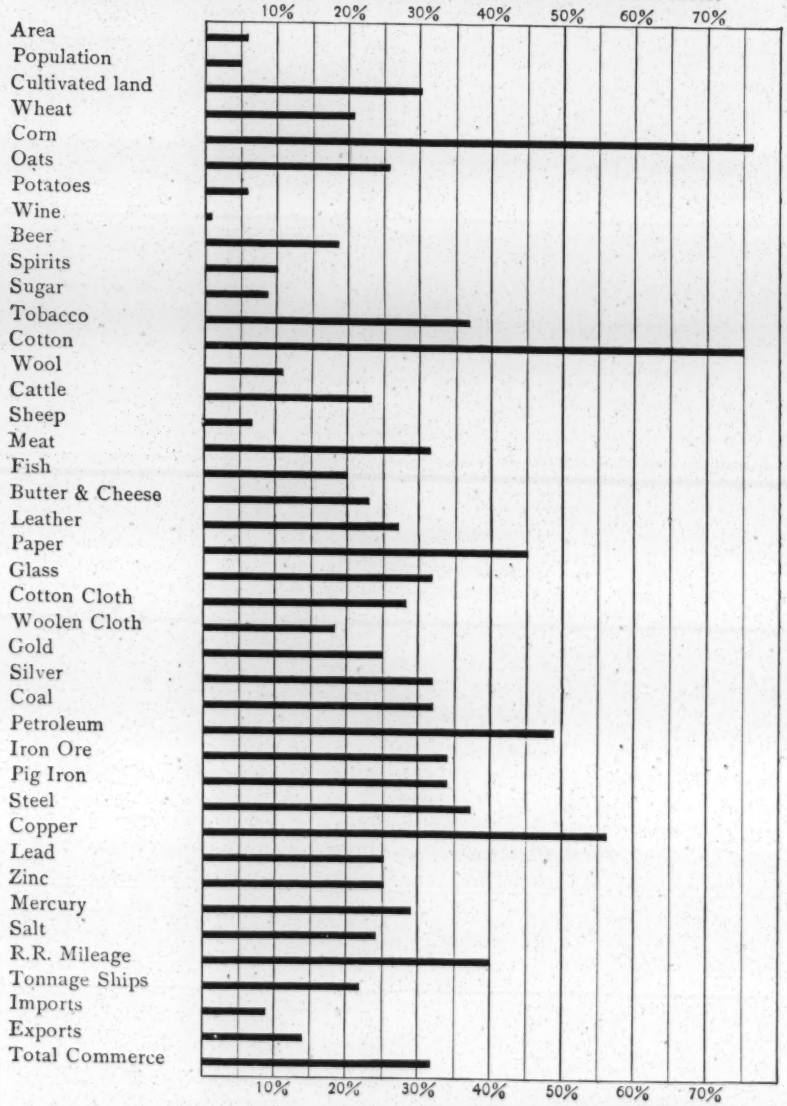
Share of the United States in the World's Industries and Products.



From Gannett, Garrison, and Houston's "Commercial Geography"

ago, has established many industrial and commercial schools of great efficiency and usefulness, and has emphasized the study of commercial geography in all her schools.* In the United States, on the other hand, we have not paid much attention to the subject until recently. Protected by a high tariff, and assisted by a general inventive faculty greater and more practical than any people have ever shown, we have gone on developing our own resources until we are

* See Nat. Geog. Mag. March, 1905, pp. 111–117.

now able to manufacture not only nearly everything we want for ourselves, but also an unlimited surplus which we are desirous of selling at best profit to other countries. The subject of commercial geography, the wants of other people and how they are supplied, now becomes to us very important, and as the authors of this book state in their preface:

"As applied to our own country, this study is especially stimulating; for we have advanced to the front rank in the leading industries of agriculture, mining, manufacturing, and transportation. If this prosperity were due entirely to the generosity with which nature has showered her gifts upon us, no lesson could be drawn from it; but the history of the past, and a comparative study of the different countries in the present, teach us that without man's earnest and thoughtful coöperation the greatest wealth of natural resources may co-exist with the greatest stagnation in development. If, therefore, in the face of the competition that grows keener as the years advance, we would maintain our superior position, we must not grope blindly, but must know the causes of success and failure and act with the clearest understanding."

"Commercial Geography" is designed as a text-book in the high school and academy, but it will doubtless prove no less useful and just as interesting to many of the grown-up generation, who were offered no such course in their school-days, and who have had to obtain their knowledge of commercial geography as best they could. It begins with a study of the influence on industrial progress of climate and topography, of social conditions, of manufacturing and transportation facilities, and of financial conditions, giving due weight to each as a factor in economic development. When this foundation is laid the student is ready to consider with a broader interest the chief commercial products of the world, their relative importance in different regions, and the modern processes of manufacture of the staple articles consumed. Then, beginning with the United States, he studies in greater detail the actual conditions existing in the principal countries of the world and the forces that are operating to the continuance or change of such conditions. The relations of the various industries to one another and their location in different parts of the world are shown graphically by maps and by percentage diagrams or tables, while definite quantities are given in tables at the end of the book.

For world diagrams the authors have generally used a map of the world on Mollweide's elliptic projection. On this map every part of the globe appears in equal proportion, with the result that the geographical distribution of products is shown without being distorted as we get away from the equator. An excellent index is given.

The Italian in America. By Eliot Lord, John J. D. Trenor, and Samuel J. Barrows. Illustrated. Pp. 268. 8 x 5½ inches. New York: B. F. Buck & Co.

What becomes of the hundreds of thousands of immigrants into the United States each year? What work do they take up to support themselves in their new country, and where do they go to? In 1904 we accepted 191,000 Italians, and in 1905 221,000. How are they prospering now? is a question which many are constantly asking, but to which we have had much difficulty in finding the answer. "The Italian in America" attempts successfully to give us this information, and we are glad to learn that it is one of a series of volumes to be published by Benj. F. Buck & Co. treating of the principal nationalities comprising our recent immigration. The authors of the present work think very highly of our Italians. They are frugal, ambitious, and loyal citizens and are important contributors to the ma-

terial development of the United States. It is unfortunate that so many have been compelled to remain in our big cities, but there are many thousands who are spreading over the land, buying and settling down on cotton plantations in Texas and Louisiana and on the citrus and fruit farms of southern California. The average Italian, says Mr Eliot Lord, prefers the country and goes there as soon as he gets enough money to take him. Mr Lord quotes Adolfo Rossi, supervisor of the Italian emigration department, as saying that 84 per cent of the Italians coming here are between 18 and 45 years of age; 84 per cent are, in other words, producers. Every Italian costs his country $1,000 to bring up; but by leaving Italy the $1,000 invested in him by his country is lost. "We spend a thousand dollars to bring up and develop a young man, and then you reap the profits of the investment."

The Far Eastern Tropics. By Alleyne Ireland, F. R. G. S. 8vo, pp. 7+339. Boston and New York: Houghton, Mifflin & Co., 1905.

This is a critical account of the government, administration, and to some extent the industrial condition of certain eastern peoples—Hongkong, Borneo, Sarawak, Burma, Malay States, Straits Settlements, French Indo-China, Java, and the Philippines.

Mr Ireland is English by birth, and while it may not be quite fair to quote, with reference to him, the old saying, "What's English is good, what isn't, ain't," the book unquestionably suggests it. He is also everywhere cocksure of himself.

Hongkong, he says, is a marvel of growth, a city of 300 000 people, built up in sixty years. But to us that is not so strange, for San Francisco, with an equal population, is younger, while Chicago, with its 2,000,000 inhabitants, is but little older. He tells us that the foreign commerce of Hongkong exceeds that of any other city on earth, forgetting that everything that comes and goes is foreign, even the nightly boat to Canton. If we should add to the foreign commerce of New York its domestic commerce, including the fleet that every night goes up the Sound, Hongkong would not be in the same class.

It is, however, with what he says about the Philippines and our conduct of their affairs that we are most interested, and to this subject he devotes nearly half the book. In company with many Englishmen, who are watching with critical eyes our course in the Philippines, he entirely misunderstands our purpose. We are not governing the Philippine Islands, as they suppose, but are helping the Filipinos to govern themselves, and between these there is a great difference. Mr Ireland is surprised and disturbed that we have not molded the Philippine government on the pattern of English colonies, and, with sublime assurance, assumes that our failure to do so is due simply to our ignorance of British colonial methods. It has not occurred to him that the statesmen who framed the Philippine government, being entirely familiar with foreign colonial history, made use of the experience of other nations only as far as it could help them. Mr Ireland can rest assured that wherever the Philippine government departs from British colonial methods there exists a good reason therefor, even though he may be unable to explain it. He also objects to our plan of developing a good government before developing the industries, forgetting that the latter cannot and will not take precedence of the former. Did the world ever see industrial development under unstable government?

Mr Ireland has a very low estimate of the industrial efficiency of the Filipino, obtaining his measure of it by the curious method of dividing the exports of the Archipelago by the number of

inhabitants. What relation the resulting figure has to anything it would be difficult to discover, but by means of it he places the Filipino at the foot of all tropical peoples, with $5 each, as compared with $12 for Porto Ricans and $44 for the people of the Federated States. Let us extend the comparison on the same basis; the Chinese would stand at the bottom with only 50 cents—*i. e.*, they are only one-tenth as efficient as the Filipinos. The people of the United States, who may fairly be regarded as efficient, rate at $18, far less than the people of the Federated States, less even than the negroes of Sierra Leone.

The fact is, as is shown in the Census Report, the Filipinos are at least as efficient as any other tropical people.

Mr Ireland criticises the expense of the Philippine government, and, as a basis for comparison with other colonial governments of the Far East, he compares the cost of government with the amount of exports. Here again there does not appear to be any relation between the two factors. The statement that the cost of government is a certain proportion of the export trade is utterly meaningless. One would suppose that he would have compared the cost of government per capita of the people governed, the ordinary method of comparison, but this would not yield the results which he wishes, since the cost of government in the English colonies in the East is much greater per capita than in the Philippines.

He ridicules the Philippine Civil Service examinations and contrasts them with those held for the East Indian service. If the examination for the East Indian service, which he instances is for the same grade of clerk as is the Philippine examination—*i.e.*, the lower grade—he merely succeeds in holding up to ridicule the Indian examinations. Why should a clerk be expected to be versed in the higher mathematics, in Sanskrit, and in the old English poets in order to audit accounts or keep books? Yet that is apparently required. The book bristles with errors and misstatements, but enough have been adduced to put the reader on his guard. H. G.

A Century of Expansion. By Willis Fletcher Johnson, L. H. D. With maps. Pp. 316. 5 x 7½ inches. New York: The Macmillan Co.

The author gives a very thoughtful analysis of our expansion as a nation. He shows that our growth has been regular, not spasmodic, and that if we would continue strong we must continue developing intellectually and physically. The saying, "When growth ceases the man begins to die," is as true of nations as of the individual man.

"Territorial expansion increases power, enlarges the sphere of activity, adds to responsibilities and duties, creates new problems for solution, leads to new relationships, and thus induces constitutional—that is, intellectual and moral—development of the nation. The physical growth of a man is steady, persistent progress, not an irregular series of disconnected spasms. We may say the same of our territorial expansion. However widely and irregularly separated by time, the individual acts of territorial acquisition are all intimately and essentially related. Order and design characterize them. The law of cause and effect is dominant among them. In the first step of expansion, in colonial times, every subsequent step was forecast and made inevitable. From Washington at Great Meadows to Dewey in Manila Bay, the span in both time and space is enormous, but it is a span of unbroken links of cause and effect—coherent, logical, and inevitable."

Mr Johnson's style is clear, concise, and rich in classic allusions and incidents. He furthermore handles his subject in a clever, suggestive way that tells just enough and stimulates the reader to do some thinking for himself.

SOME RECENT GOVERNMENT REPORTS

The Avocado. G. N. Collins, Bureau of Plant Industry, Bull. 77.

The Variability of Wheat Varieties in Resistance to Toxic Salts. L. L. Harter, Bureau of Plant Industry, Bull. 79.

Agricultural Explorations in Algeria. Thomas H. Means, Bureau of Plant Industry, Bull. 80.

Evolution of Cellular Structures. O. F. Cook and Walter T. Swingle, Bureau of Plant Industry, Bull. 81.

Grass Lands of the South Alaska Coast. C. V. Piper, Bureau of Plant Industry, Bull. 82.

The Vitality of Buried Seeds. J. W. T. Duvel, Bureau of Plant Industry, Bull. 83.

The Mexican Cotton Boll Weevil. W. D. Hunter and W. E. Hinds, Bureau of Plant Industry, Bull. 51.

Experiments in the Culture of Suger Cane and its Manufacture into Table Syrup. H. W. Wiley, Bureau of Chemistry, Bull. 93.

Tobacco Investigations in Ohio. George T. McNess and George B. Massey, Bureau of Soils, Bull. 29.

The Commercial Cotton Crop. James L. Watkins, Bureau of Statistics, Bull. 34.

Statistics of the Fisheries of the New England States. A. B. Alexander, Bureau of Fisheries, Bull. 575.

A Revision of the Cave Fishes of North America. Ulysses O. Cox, Bureau of Fisheries, Bull. 579.

The Gas Disease in Fishes. M. C. Marsh and F. P. Gorham, Bureau of Fisheries, Bull. 578.

Critical Notes on Mylocheilus Lateralis and Leuciscus Caurinus. John Otterbien Snyder, Bureau of Fisheries, Bull. 574.

Notes on the Fishes of the Streams Flowing into San Francisco Bay, Cal.

The Life History of the Blue Crab. W. P. Hay, M. S , Bureau of Fisheries, Bull. 580.

Geology of the Tonopah Mining District, Nevada. J. E. Spurr. Geological Survey, Prof. Paper 42.

NATIONAL GEOGRAPHIC SOCIETY

THE completed program of the popular and technical meetings of the National Geographic Society for 1905–1906.

THE POPULAR COURSE

The addresses in this Course will be delivered in the National Rifles Armory, 920 G street, at 8 p. m. on Friday evenings of the following dates:

November 10—"A Review of the Russo-Japanese War—from the Sinking of the *Variag* to the Signing of the Treaty of Portsmouth." By Mr Robert L. Dunn, special correspondent of Collier's Weekly in the Far East.

The address is a pictorial summary of the war, being illustrated by nearly 200 views.

November 24—"The Panama Canal." By Hon. James R. Mann, Member of Congress from Illinois.

December 8—"What Shall be Done with the Yosemite Valley." By Mr William E. Curtis. Illustrated.

The Yosemite Valley has been receded to the federal government by act of the California legislature, but has not yet been formally accepted by Congress.

December 9 (Saturday)—"A Military Observer in Manchuria." By Major Joseph Kuhn, U. S. A. Illustrated.

December 22—"An Attempt at an Interpretation of Japanse Character." By Hon. Eki Hioki, First Secretary of the Japanese Legation.

January 5—"Russia and the Russian People." Mr Melville E. Stone, General Manager of the Associated Press, has accepted the invitation of the Society to deliver the address on this subject, provided the demands of the public service do not interfere.

January 9 (Tuesday)—"The Ziegler Polar Expedition of 1903–1905." By Messrs W. S. Champ, Anthony Fiala, and W. J. Peters.

A novel feature of this meeting will be the exhibition of moving pictures of Arctic scenes.

January 19—"Railway Rates." By Hon. Martin A. Knapp, President of the Interstate Commerce Commission.

February 2—"Austria Hungary." By Edwin A. Grosvenor, LL. D., Professor of International Law in Amherst College, author of "Constantinople," "Contemporary History," etc.

February 16—"Africa from Sea to Center." By Mr Herbert L. Bridgman. Illustrated.

Africa in transition today challenges the attention of the world. Few intelligent Americans know to what extent its possibilities have been developed since Livingston's day, a development that in rapidity promises to exceed that of North America.

February 23—"The Personal Washington." By Mr W. W. Ellsworth, of the Century Company. Illustrated.

This is not a lecture in the ordinary sense of the word, but it is an exhibition, through the medium of the stereopticon, of the greatest collection of prints, manuscripts, and letters referring to the personal side of Washington, ever brought together.

March 2—"Our Immigrants: Where They Come from, What They Are, and What They Do After They Get Here." By Hon. F. P. Sargent, U. S. Commissioner General of Immigration. Illustrated.

March 16—"Oriental Markets and Market Places." By Hon. O. P. Austin, Chief U. S. Bureau of Statistics. Illustrated.

March 30—It is hoped that official business will permit the Secretary of the Navy, Honorable Charles J. Bonaparte, to address the Society on "The American Navy."

April 13—"The Regeneration of Korea by Japan." By Mr George Kennan. Illustrated.

SCIENTIFIC MEETINGS

The meetings of this course will be held at the new home of the Society, Hubbard Memorial Hall, Sixteenth and M streets, on Friday evenings, of the following dates.

November 17—"Morocco." By Mr Ion Perdicaris.

November 25 (Saturday)—"The Panama Canal." By Mr Bunau-Varilla.

December 1—"The Development of the Mineral Resources of Alaska, with particular reference to the Fairbanks and Nome Regions." By Mr Alfred H. Brooks, Chief of the Alaskan Division, U. S. Geological Survey.

December 15—"Surveying our Coasts and Harbors." By Hon. O. H. Tittmann, Superintendant U. S. Coast and Geodetic Survey.

December 29—"Problems for Geographical Research." By Gen. A. W. Greely, U. S. A.

"The Binding Power of Road Material." By Mr A. S. Cushman.

January 12—Annual meeting. Reports and elections. "Progress in the Reclamation of the West." By Mr F. H. Newell, Chief Engineer Reclamation Service.

January 26—"The Carnegie Institution." By President R. S. Woodward.

February 9—"The Introduction of Foreign Plants." By Mr David G. Fairchild, Agricultural Explorer, U. S. Department of Agriculture.

February 24 (Saturday)—"Hunting with the Camera." By Hon George Shiras, Member of Congress from 3rd District, Pennsylvania.

March 9—"The United States Bureau of the Census." By Hon S. N. D. North, Director.

March 23—"The Death Valley." By Mr Robert H. Chapman, U. S. Geological Survey.

April 6—"The Total Eclipse of the Sun, July, 1905, as Observed in Spain." By Rear Admiral Colby M. Chester, U. S. N., Superintendent U. S. Naval Observatory.

April 20—"The Protection of the United States Against Invasion by Disease." By Dr Walter Wyman, Surgeon-General Marine Hospital Service.

WE have published a new edition of our map of Alaska, which was prepared by the United States Geological Survey. The map is 36 by 42 inches, in 3 colors, and is the first contour map of Alaska that has been made. : : : : By mail, 25 cents.

National Geographic Society

Hubbard Memorial Hall : Washington, D. C.

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